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ARISTOTLE'S PSYCHOLOGY

A TREATISE ON THE PRINCIPLE OF LIFE

(*DE ANIMA* AND *PARVA NATURALIA*,

TRANSLATED WITH INTRODUCTION AND NOTES

BY

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PREFACE.

THE comparative inaccessibility of the *Parva naturalia* (they exist in English only in Taylor's paraphrase) has induced me to prepare an English version of these important tractates. To this I have added a translation of the *De anima*, in order that English readers might have in a single volume a practically complete account of Aristotle's psychological theories. Such a work seemed to me to be all the more necessary at the present time in view of the need of available primary sources for historical research in philosophy and psychology. An adequate history of psychology has not as yet been written.

The translation of Aristotle's works, owing to their crabbed Greek, their puzzling lacunae and breviloquence,—oftentimes they are almost unintelligible jottings intended, perhaps, for lecture-notes or for later elaboration which they never received,—has at no time been regarded by scholars as an easy or attractive task. It is only their immense historical significance and the intrinsic value of their content that could induce one now-a-days to set hand to the work. The *De anima* and *Parva naturalia* cannot be said to be in a more satisfactory condition than the other writings of Aristotle. I have, however, attempted no speculative reconstruction, such as has been applied with some success to the *Politics* by Barthélemy-St.-Hilaire and Susemihl. The attempt has not been very fortunate in the case of Essen's restoration of the *De anima*, and, so far as I know, his predecessors in the same endeavour have not been more successful. Growing distrust of the radical treatment of texts seems to me a hopeful mark of critical scholarship. My translation is based on the text of the late Wilhelm Biehl (Teubner series), whose emendations I have constantly compared with the Berlin edition, and with whose conservative judgment I have generally found myself in accord. Where I have deviated from his text, I have stated my reading in a foot-note. In 1897 I made a careful examination of Codex E (Parisiensis Regius 1853), the best of the MSS. for the texts here translated, but as Biehl collated this Codex in the same year and published his *Parva naturalia* the year following, my work was rendered unnecessary. In any case, I was not interested primarily in textual questions, excepting in so far as the establishment of the text was ancillary to the establishment of doctrine. I have aimed, therefore, to avoid the accumulation of notes of a purely scholastic kind, which in the present volume could only be marks of a diligent pedantry, and while I have neglected no source of information and assistance amongst ancient or modern commentators, I have rigidly excluded all such matter as had no real interest for the doctrinal exposition of the treatises in hand, or for the history of science.

M. Rodier's text of the *De anima* with translation and notes (2 vols., Paris, 1900) is a notable product of French scholarship, in which the widely scattered materials of interpretation have been brought together and utilized with singular industry and insight. M. Rodier's volumes have been prepared with a bias of interest different from that with which my own work is written, concerned, as they are, largely with questions of text, of philological criticism, and of the literary aspects of interpretation. They do not include the *Parva naturalia.* The aim of the present translation and introduction is rather to make easily accessible to English scholars the scientific content of these Aristotelian treatises, and thereby to facilitate inquiry into the history of philosophical and psychological ideas. For this reason my work does not duplicate the much wider and more ambitious investigations of M. Rodier, to whose scholarly labour I wish to pay my warmest tribute.

I desire further to record here my grateful acknowledgment of various and valuable help from my colleagues, Professors Bennett, Creighton, and Titchener. Professor Titchener has read the proof-sheets of the entire volume, and to him I am especially indebted for many suggestions and criticisms.

CORNELL UNIVERSITY, ITHACA, N.Y.,
July 29*th*, 1902.

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INTRODUCTION.

I.

THE SOUL AND LIFE.

TLE'S theories regarding the structure and functions
'soul' are found chiefly in the *De Anima*[1]
he tractates collectively known as the *Parva*
alia.[2] These works belong to that part of the
which deals with what Aristotle understands
ysics, *i.e.* the world of corporeal substances, sub-
s subject to motion and rest. Mathematical bodies,
eing subject to motion, are excluded. Soul is
ed to all bodies whose principle of motion is
nt in their own nature. In other words, it is to all
ic bodies that Aristotle applies the term; to him the
'soul' is synonymous with the word 'life.' Accord-
the higher phenomena of mental life are included
the vital activities. Aristotle, therefore, regards
ology from the point of view of Biology.

philosopher of Stagira is known chiefly through his
on Logic, Metaphysics, Ethics, and Politics. It
nainly through these disciplines that he dominated
tellectual development of the western world down to
a of modern science; and yet his writings on Physics

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ee note, Translation, p. 1.

[2] See note, Translation, p. 145.

occupy more space (taking as a standard the Berlin edition, which contains, it is true, some spurious treatises) than all the other treatises put together. Suidas, indeed, gave him the title of the "Secretary of Nature," while Dante, who was conversant with the speculative or practical side of his philosophy, called him "the master of those that know."[1] The studies of Aristotle appear to have been concerned chiefly with the phenomena of nature, whose processes it was the primary function of his philosophy to explain.

The thing which most astonished Athenaeus (one of the most learned Greeks of the Ptolemaic era) in his reading of Aristotle's works, was the Stagirite's wonderful knowledge of animal life. He says in the Deipnosophists: "Aristotle, my dear Democritus, about whom the sages incessantly talk and whose accuracy they constantly praise, is a marvel to me. I should like to know from what Proteus or Nereus of the deep sea he learned what fish do, how they sleep, how they live. For he has told us in his writings all about these things, so that he has become, in the words of the comic poet, 'a wonder to fools.'"[2]

In contrast with this trivial, popular conception of Aristotle's work, I quote here Aristotle's own words touching his attitude towards the various spheres of scientific inquiry, words very significant for their singular catholicity. "By way of introduction we observe that some members of the universe are ungenerated, imperishable, and eternal, while others are subject to generation and decay. The former are excellent beyond compare and divine, but are less accessible to knowledge. The evidence that might throw light on them and on the problems which we long to solve respecting them, is furnished but scantily by sensation, whereas respecting perishable plants and animals we have abundant information, living as we do in the midst of them, and ample data may be collected concerning all their different varieties if only we are willing to take sufficient pains. Both departments, however, have their special charm. The scanty conceptions to which we can attain of celestial things give us, from their excellence, more pleasure than all our knowledge of the world in which we live; just as a half glimpse of persons whom we love is more delightful than a leisurely view of other things, whatever their number and dimensions. On the other hand, in certitude and in completeness our knowledge of terrestrial things has the advantage. Moreover, their greater nearness and affinity to us balance somewhat the loftier interest of the heavenly things that are the objects of the higher philosophy. Having already treated of the celestial world, as far as our conjectures could reach, we proceed to treat of animals, without omitting, to the best of our ability, any member of the kingdom, however ignoble. For if some have no graces to charm the sense, yet even these, by disclosing to intellectual perception the artistic spirit that designed them, give immense pleasure to all who can trace links of causation and are inclined to philosophy."[1]

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[1] Il maestro di color che sanno. *Inferno*, iv. 131.

[2] *Deipnosophistae*, Bk. viii., chap 47.

---

[1] Aristotle, *On the Parts of Animals*, translated by Ogle, London, 1882, p. 16.

Aristotle regards the physical world as divided into two realms (the later and now obsolete division into three kingdoms: animal, vegetable, and mineral, is due to the alchemists): (1) the organic world (τὰ ἔμψυχα); and (2) the inorganic world (τὰ ἄψυχα). The characteristic mark of the organic world is the possession of soul (ψυχή), by virtue of which it is endowed with the power of self-movement. Its development and transformations are due to this native soul-force or life. Life is the universal form of organic activity; sensation and the various elements of consciousness are specific forms. Nutritive life and mental life are different manifestations of a single psychical power, the latter representing a higher stage in the evolution of ψυχή. 'Life,' or the inherent capacity of a thing to effect changes in itself, has several meanings. Whatever possesses any of the following capacities is said to 'live', (1) reason; (2) sensation; (3) local movement; (4) internal movement or transformation, viz. nutrition, growth, and decay. The last power is common to all living things, and is the basis for the further development of the higher powers. These various forms of self-movement are identical with the different types of life. The lowest and least complex of all the forms is the threptic or vegetal life manifested in the functions of nutrition, growth, and decay.

Aristotle conceived of Nature's processes as moving without a break in an ascending scale from the inanimate world to the most complex forms of animate existence.[1] *Natura nihil facit per saltum.* There is an unbroken continuity in terrestrial life. The initial form of this is found in plant-life. The plant-organism is simpler than any other, its functions are confined to nutrition and reproduction. The function of growth or vegetation in plants is analogous to the nutritive functions in higher organisms. A process of conversion and assimilation is carried on in both cases and by analogous organs. Roots are analogous to the mouths of animals,[1] or, as Aristotle elsewhere employs another analogy, they are like umbilical veins that take in nourishment from the earth as the embryo is maintained by its attachment to the uterus.[2] Plants, furthermore, as Aristotle observed, exhibit the morphological tendency to develop their organs at the extremities, while animals tend to develop theirs at the centre.[3]

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[1] Cf. *Hist. anim.* 588*b* 4; *De part. anim.* 681*a* 12.

The transitional form of life in proceeding from plants to animals, or from phenomena of growth to phenomena of sensation, is found in the Zoophytes. There are some marine animals, Aristotle says,[4] concerning which it is difficult to say whether they are plants or animals, for many of them grow on rocks and die if detached. To these transitional forms belong the sponges, holothurians, star-fishes, acalephae (sea-anemones), and sea-lungs.[5] All of these possess a low degree of sensation, and some of them are incapable of movement. Aristotle's reason for classifying sponges amongst animals seems to have been that they possess rudimentary sensation,[1] although they are incapable of locomotion, and can be regarded only as belonging to the initial stage of animal development. Nature completes the transition from plant organisms to animals proper by an increased or added activity of the soul, in which are manifested the further phenomena of sensibility, with which desire is associated, and desire demands locomotion. An animal soul is a more complex and more highly developed form of the original life-principle.

---

[1] *De an.* 412*b* 3.

[2] Cf. *De part. anim.* 650*a* 20, 686*b* 35; *De gener. anim.* 745*b* 23.

[3] Cf. G. H. Lewes, *Aristotle*, pp. 187, 192.

[4] *Hist. anim.* 588*b* 12.

[5] Cf. Ogle, *Aristotle on the Parts of Animals*, p. 225.

While we in modern times, in popular language at least, differentiate the life found in the plant-world from that which is found in the animal-world (though the boundary between these two is not exactly defined) by the obvious distinctions of 'vegetable' and 'animal' life, Aristotle regards them as fundamentally the same. He looks upon the functions of sensation, locomotion, and conceptual thought as a higher development of the vital principle found in plants. We distinguish between sensation and conceptual thought without ascribing them to a different mind, as Plato did; but Aristotle goes further and maintains that not only these, but also the function of nutrition, are due to the same unitary vital force. It is, however, a distinctly marked stage that nature makes in the development of the vital principle when sensation is exceeded and rational thought is reached. This new phenomenon is confined to man, and is the last stage in the evolution of ψυχή. Soul is, therefore, in the opinion of Aristotle, the unity in which the principles of life, sense-perception, and thought are embraced. These taken together form an ascending series in which the higher form always includes and presupposes the forms below it.[1]

---

[1] *Hist. anim.* 487*b* 9.

The function of nutrition furnishes the basis of sensation; sensation furnishes the basis of conceptual thought. The lower functions exist teleologically for the higher. Man, consequently, is the apex of creation, because all forms of life terminate in him as the complete development of what is contained implicitly and imperfectly in the lower organisms. These forms of life or soul, as we have enumerated them, are the following:

1. The nutritive or vegetal life.
2. Perceptive power or the life of sensation.
3. Creative power or desire attended by the capacity of local movement, sometimes called by Aristotle the kinetic soul.[2]
4. The life of intellect or reason, called the logistic or dianoëtic soul.

These, as I have pointed out, are various manifestations of a unitary life. The soul is not divided into separate faculties or parts. In every organism it is a unit. In this respect Aristotle differs widely from Plato. The division of the soul into kinds is only a convenient abstraction. The soul's powers are not topographically separable as in the Platonic psychology. The difference in kind is merely a difference in mode of operation and expression, determined by the nature of the materials with which the soul is concerned. Thought, growth, and decay are modes of the single life of the organism. Aristotle, therefore, conceived his entire psychology under a biological form.

---

[1] *De an.* 434*a* 23 ff.

[2] *De an.* 413*a* 23, 413*b* 12—31.

[3] *De an.* 413*b* 27.

Everything that moves itself contains a duality of moving principle and thing moved, *i.e.* a duality of 'form' and 'matter,' to use Aristotle's metaphysical terminology. Every living thing, a plant no less than a man, is a composite being (σύνολον), viz. a composite of soul and body. The soul is the cause of motion and change, and is therefore the 'efficient cause'; it is further that which determines the form or individuality of the organism, and is therefore the 'formal cause'; it is also the end for which the body exists, and is, for this reason, the 'final cause.' The body is the 'material cause' or condition of the composite, while the soul represents all of the principles of activity in the organism. Soul is defined by Aristotle as the "entelechy or complete realization of a natural body endowed with the capacity of life."[1] The soul or vital principle is not itself corporeal, although it is inseparable from the body, as form is inseparable from matter.[2] Soul and body are not distinct things that do or can exist apart. Their separation is only notional. They no more exist apart than do concave and convex.

Soul is to be found in every part of the body. This is observable in the case of graftings, where the entire parent form can be reproduced from a section. Insects live for some time after bisection, but they do not continue to live indefinitely, because they lack organs for maintaining life. As we go up the scale of living forms, this diffusion of soul throughout the body becomes less and less marked; the higher the order of life the greater the centralization. In the case of animals, the body consists generally of three main divisions: the head, thorax, and abdomen. Aristotle points out[1] that if a wasp's head is cut off, the thorax and abdomen continue to live for a time; if the abdomen is cut off, the head and thorax continue to live. In other words, the part which is conjoined with the thorax exhibits this continuance of vitality. For this reason it would appear that the anatomical centre is also the life-centre. This is, furthermore, on *a priori* grounds the best and most advantageous position. It is reasonable to suppose, therefore, that nature in her wise economy[2] has employed this central section as the vital centre.

---

[1] *De an.* 412*a* 20, 412*b* 5.

[2] This does not apply to the Prime Mover as pure 'form.' The relation of the active reason to the body is discussed below in the chapter on *Reason* (chap. viii.).

This view, however, is not merely derivable from rational considerations, but is also supported by grounds of observation. The life-centre may be localised not only in the thoracic region, but specifically in the heart. For this statement Aristotle adduces the following arguments: (1) disease of the heart is the most rapidly and certainly fatal; (2) psychical affections, such as fear, sorrow, and joy cause an immediate disturbance of the heart; (3) the heart is the part which is first formed in the embryo, and, as he says in the *History of Animals*,[3] it appears in the egg of the chicken on the third day of incubation as a red spot (the

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[1] *De juvent.* 468*a* 21; *De part. anim.* 667*b* 22; *De respir.* 479*a* 5.

[2] Cf. Leibniz's "choix de la Sagesse," *Princ.* 11; also *Nouv. Ess.* II., ch. xxi, 13, Langley's translation, p. 183.

[3] *Hist. anim.* 561*a* 6-12.

punctum saliens of later writers) which palpitates and whose movements are those of an organism endowed with life.

The heart is at once the physiological and psychical centre of man. In as much as Aristotle identifies life with soul, it is a matter of consistency for him to place the seat of the soul in the vital centre. He rejects the doctrine of Plato and Diogenes of Apollonia, who regarded the brain as the organ of mind. To Aristotle the brain is merely a regulator for the temperature of the heart; the brain is bloodless and cool, and the blood and warm vapours from the heart rising to this are lowered in temperature. By this physiological device, conjoined with the service of respiration, Aristotle supposes that the system is maintained in a heat-equilibrium.

The material element in which the soul is immediately incorporated is heat or fire, but the soul is not identical with this, as Democritus thought. Nor is the vital heat ordinary fire, but some subtle principle analogous perhaps, as Ogle says,[1] to that imponderable and hypothetical matter of the physicists known as Ether. In accordance with his theory, Aristotle was naturally forced to attribute vital heat to plants and the cold-blooded animals, but his grounds for this position are not to be found in any of the extant works. He had, of course, no knowledge of the chemical elements of oxygen and carbon. The vital caloric of the body is kept up by food which serves as fuel. This heat which, according to Descartes, is produced by fermentation or, according to Haller, by friction between the blood particles, is being constantly generated and constantly given off. To prevent an excessive production of animal heat, the respiration of the lungs, along with the cooling function of the brain above referred to, is the most important means. In the case of fishes the same thing is accomplished by bathing their gills in a medium of lower temperature than their bodies.

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[1] Aristotle, *On Youth and Old Age*, trans. by Ogle, Introd. p. 9.

As to the cause of the natural and normal extinction of life, Aristotle says it is due to loss of balance in the production and consumption of heat. The heat is gradually extinguished when the generation of heat, as in old age, is not adequate to the demand of consumption. The length of life in any animal varies according to its material constitution and the suitability of its physical surroundings. As a general rule, animals or plants of great bulk[1] are long lived; small ones are short lived; sanguineous animals live longer than those that have no blood; and a long period of gestation is usually correlated with long life. The purpose of the threptic soul is nutrition and reproduction. The food which is taken up into the vegetable or animal organism and nourishes it, has its end not merely in the continuance of the individual's life, but has a higher end in the formation of another life of like kind by reproduction. The function of the individual is not merely to live, but to reproduce and so to maintain life's continuity.

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[1] On the longevity of animals, see translation, pp. 256-265.

II.

The Faculties of the Soul.

Plato conceived three psychological elements—which correspond roughly to cognition (*νοητικόν*), feeling (*ἐπιθυμητικόν*), and conation (*θυμοειδές*)—in terms of ethical value. Cognition has the highest worth, and conation stands next in rank. Feeling has the lowest moral value. These are not faculties or *δυνάμεις* of the soul, but 'parts' (*μέρη*). They consitute real entities in the psychophysical whole, just as the three divisions of government in the state have separate and real existence. The two lower parts, however, have no share in pre-existence or immortality.[1] These are never referred to as powers or faculties (*δυνάμεις*).

The term 'faculty' is applied by Plato to certain processes of the soul which are determined by the object to which they are directed or the results they accomplish. Sense-perception (*αἴσθησις*), opinion (*δόξα*), and conceptual knowledge (*ἐπιστήμη*) are described by Plato as 'faculties.'[2] The faculties depend upon the reciprocal relation between subject and object. The 'parts' of the soul (the Platonic 'parts' are the historical predecessors of the post-Platonic 'faculties'), on the other hand, are entities, situated in various regions of the body, and denote certain qualitatively distinct types of psychical life, arranged on a scale of ethical value. The seat of reason is in the brain, the topographically higher region being correlated with the reason's higher worth; the conative part is situated in the thorax, more particularly the heart, so as to be the convenient ally of the reason in the ethical regulation of the individual's life;[1] the feelings and appetites are situated in the abdominal cavity, their upper boundary being the diaphragm and their chief organ the liver.

---

[1] Cf. Siebeck, *Geschichte der Psychologie*, Th. I., Abth. i., p. 203.

[2] *Protagoras*, 330A.

Plato's entire psychology, in which the soul's parts are separated into existentially distinct units with distinct anatomical organs, is ethico-teleologically determined. Aristotle's psychology, on the contrary, is biologically determined; the soul is a unitary life functioning in distinct modes or faculties.[2] It is a single indivisible mind expressing itself in nutrition, sense-perception, imagination, memory, reasoning.[3] To Aristotle there is a thinking substance, a 'soul,' which possesses certain distinct capacities. In the term 'faculty' or 'potentiality' there is implicit the idea of latent or possible activity. Further, *δύναμις* conveys the notion of being native and not acquired (*ἕξις*).

In their action, manifestation, or processes, the faculties of Aristotle are merely a convenient classification of psychical phenomena into groups.[4] They correspond to the fundamental divisions in organic life — plant, brute, man. The psychological faculties or functions, therefore, represent the several stages in the development of the forms of organic life. The soul operates in every particular organism under one or other of these forms, viz. it effects nutrition, or it experiences sensation, or it causes l motion, or it thinks, or in the highest organism it under all four forms. Sometimes Aristotle speaks eve five faculties, viz. the nutritive, sensitive, conative, l motive, and rational;[1] again he speaks of four,[2] and other times of only three, owing to the identification of orectic and sensitive powers.[3]

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[1] *Timaeus*, 70A ff.

[2] *De juvent.* 467*b* 25.

[3] See the chapter on the *Creative Reason*, chap. viii.

[4] Cf. Wundt's *Grundzüge der physiologischen Psychologie*, 4te Aufl. Vol. i., pp. 10 ff.

It is evident from this that Aristotle laid no great wei on any fixed enumeration of the faculties, and he expre says that from one point of view these 'parts of the s appear to be indefinitely large in number.[4] If we regard fundamental aspects, therefore, under which the soul m fests itself, Aristotle defines it as that principle by w we live, have sensation, and think.[5] The vegetative threptic life is confined to the phenomena of nutri and reproduction[6]; sensitive life is confined to the ph mena of cognition when the object is spatially temporally determinate, *i.e.* an individual thing; rati life is concerned with phenomena of cognition when object is an universal or an abstraction.[7] The stages in development of organic life are differentiated from another in terms of psychical activity; plants live reproduce; the lower animals live, reproduce, and sensation; man lives, reproduces, has sensation, and reas Each higher stage includes within itself the fundame functions of the lower stages. Aristotle's view the physical world may be presented schematically as follows:

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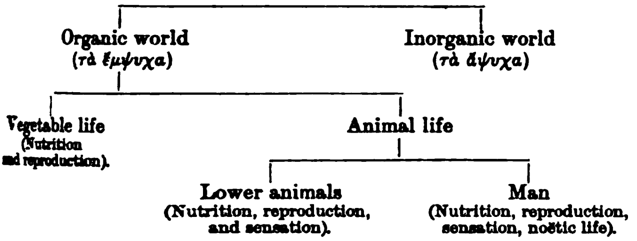
[1] *De an.* 414*a* 31. [2] *De an.* 413*b* 12. [3] *De an.* 431*a* 14.

[4] *De an.* 432*a* 24. [5] *De an.* 414*a* 12.

[6] *De an.* 413*a* 22 ff., 415*a* 25; *De gener. anim.* 740*b* 30.

[7] *De an.* 417*b* 22; *Anal. post.* 87*b* 37; *De insom.* 458*b* 1 ff.; *Me* 999*b* 27 ff.



III.

NUTRITION AND REPRODUCTION.

NUTRITION is the simplest form of organic movement. Every living thing must have the power of nutrition, for organic development is not possible without food. All sensation and noëtic activity presuppose this nutritive faculty as their basis. To use Aristotle's phraseology, those organisms which assimilate form and matter at once and are incapable of assimilating form without matter, live exclusively a vegetative life. In other words, the process of vegetal growth is a physical process, *i.e.* the organism takes up certain corporeal substances into its physical structure, and it does so through the agency of an inherent psychical or vital principle.[1]

In sensation, on the other hand, the form of the object (without its matter) is taken up by the agent. The significance or form of the object is assimilated by sensation; the matter of the object is assimilated when the nutritive power appropriates it. Indeed, the whole of the psychi life is carried on by means of assimilation. The threp power by the instrument of heat converts foreign substan into forms similar to organic structures, and into th structures the substances are then absorbed. Analogica the data of sensation and experience are assimilated i the concept, and the qualities of things are assimilated i the forms of sense-perception. The entire process psychical life is a process of conversion, in which obje are reduced to terms of likeness with the subject agent.

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[1] *De an.* 424*b* 1.

There was a pre-Aristotelian controversy as to wheth nutrition is effected by the like or the opposite.[1] Aristo says that assimilation implies indeed original oppositi but the unlike undergoes in digestion a process whereby is rendered like, and as such is taken up by the organi as part of its physical structure. In their ultimate phas therefore, the like is nourished by like. Such is Aristotl conclusion on this academic question of the Early Gre schools, a discussion which had concerned itself mai with Epistemology, *i.e.* with the question whether the p ception of a quality is due to the possession of a like or opposite quality in the agent.

Food after it has been concocted and assimilated becon the means (1) of nourishment, (2) of growth, (3) reproduction. It nourishes in so far as it sustains the l of an individual and enables it to persist; it causes grow in so far as it acts quantitatively and enables t individual to attain its normal mass in development;[1] it makes reproduction possible by conversion of a part of the food into seminal matter.[2] One must observe three main facts in nutrition, viz. the cause, the object, and the means. The cause is the elemental soul or threptic energy; the object is the body animated by the soul; the means is the food. Food, however, can maintain the life of an individual only for a limited time. The continuity of life is accordingly provided for by the deposit of semen, which contains potentially all the elements of the organism; thereby the propagation of a life similar to that of the parent is secured.[3] This is the highest and most important service of the threptic power, because it gives to perishable creatures an approximate immortality by perpetuating the species, and this is what every creature instinctively aims at. It is the final cause of every creature's natural life.[4] All of nature's activity is purposive. Food is utilized for specific ends and in specific ways. No single substance is adequate for the nourishment of a physically complex body, and every organic body is complex. Even the lowest organisms, plants, employ various substances for their nutrition. Food, in as much as it is the material for the formation of body, must contain all the body's substances. Food, must consequently, be multiform. There is, however, one element in food which is more nutritive than any other, viz. the sweet. It is this element in edible things that is mainly causative of growth, and Aristotle makes a curious use of this element to explain the relative longevit bees.[1] Fat is to be classified amongst sweet substances.

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[1] *De an.* 416*a* 25; cf. also on the Empedoclean and Anaxagorean theo of sensation, translation, pp. 35, 150, 166.

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[1] *De an.* 416*b* 10 ff. [2] *De gener. anim.* 725*a* 15 ff.

[3] Cf. Aristotle, *On the Parts of Animals*, tr. by Ogle, pp. 239, 240.

[4] *De an.* 415*a* 29.

Food undergoes no process in the mouth beyond of mastication.[2] Aristotle knew nothing of salivary gla yet mastication, though not itself a digestive process, necessary preliminary to digestion. From the orga seizure and mastication the food passes to the stom where it undergoes what Aristotle calls concoction. is accomplished by animal or psychical heat, a form of which in its vivifying power differs from ordinary and is supplied mainly from the spleen and liver. solid and indigestible portions pass off by the lower bo while the fluid portion,[3] which alone is employed nutrition, is absorbed by the blood-vessels and intesti The stomach and intestines are to animal organisms w the ground is to plants;[4] the roots as channels of nour ment for the plant correspond to the blood-vessels in animal. The veins have exceedingly fine invisible o ings such as the pores in unglazed pottery, and t minute openings permit the nutritive fluid to ooze thro into them, and by them it is carried from the mesenter the heart. Their content is not yet blood, it is an completely prepared serum (ἴχωρ).[5] In the heart, warmest organ of the body, to which this serum is immediately carried from the mesentery by the veins, re-concocted and converted into blood. It is then ready assimilation into the organs, for building up their waste, and for adding to their growth. The amount of blood thus generated is very small in proportion to the materials consumed, otherwise the body would grow to enormous bulk. The blood in its final state of concoction is carried by the arteries and veins from the heart to all parts of the body. Each organ assimilates such elements as are adapted to its growth. The process of nutrition goes on most actively during sleep.[1] Such parts of the blood as cannot be utilized in organic anabolism are excreted in the form of sweat, bile, and nature's various means of relief through waste, while surplus nutritious matter takes the form of excess fat, seminal deposit, nails, hair,[2] and other masses whose quantitative permanence is unnecessary for the maintenance of life.

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[1] *De long. et brev. vit.* 467*a* 4.

[2] *De part. anim.* 650*a* 10 ff.

[3] *De somno*, 456*a* 30 ff.; *De part. anim.* 651*b* 5 ff.; *De gener. anim.* 7

[4] *De part. anim.* 678*a* 7 ff.

[5] *Hist. anim.* 521*a* 12 ff., 521*b* 2; *De part. anim.* 651*a* 18.

The two fundamental concepts with which Aristotle's entire philosophy operates, viz. form and matter, or actuality and potentiality, are derived from his observation of organic life. Potential matter in the organic world is being constantly transformed by an inherent life-movement into significant structures, and a formative or psychical principle is constantly active in converting passive matter to definite ends. Without the soul the body is motionless, and the organs of the body are organs only homonymously[3] —a dead hand is only the homonym of a hand, it has the name of a hand without its significance or function. All life (not only what is modernly understood by vital phenomena, but all rational life) is a form of motion, of which there are several varieties: γένεσις, αὔξησις, ἀλλοίωσις, φορά. The most elementary form of organic movement is, as has been said, growth (αὔξησις).[1] The soul is in every part of the body, and, although not itself corporal, it is inseparable from the body. This diffusion of soul is more apparent the lower we go in the scale of animate existence.[2] Organic centralization increases in direct ratio with the complexity of the organism, but even in the lowest forms of animal life there is a certain degree of centralization, lowest of all in the plants. The only form of life which is separable from the body is that of the active reason, and even this, so far as its real content is concerned, is an 'entelechy of the body.'

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[1] *De somno*, 455*a* 1.

[2] Cf. Aristotle, *On the Parts of Animals*, tr. by Ogle, p. 202.

[3] *De gener. anim.* 735*a* 8; *De an.* 412*b* 14, 21.

Heat is the soul's material substrate, in which the soul is immediately incarnate. The soul is not itself heat. "Birth is the original suffusion of the nutritive soul with heat, and life is the maintenance of this heat."[3] The manner in which this heat is maintained by the fuel of food through concoction has been already described. Not only must the body have this heat in order to live, but the heat must be regulated and kept within normal limits. There must be some physiological provision for the reduction of temperature; otherwise the fuel in the stomach would constantly generate heat to excess, especially during the process of digestion. Mechanism for reducing temperature in the pulmonate animals is furnished by the lungs[1] and brain, in aquatic animals by the gills. Death comes to all organisms when the supply of vital heat fails; the organs of nutrition and respiration become through lapse of time incapable of supplying and regulating this heat, it being both inadequately generated and inadequately controlled, and so "the fire of life is snuffed out."[2] When the basal psychical function ceases, the higher life of mind is no longer possible, for the soul is not divided into parts, but is an unit.

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[1] *Phys.* 260*a* 25 ff.

[2] *De an.* 411*b* 20, 413*b* 20.

[3] *De respir.* 479*a* 29. Birth or genesis means for Aristotle not the separation of the young from the mother's body, but the process of fecundation.

IV.

SENSATION.

THE immediate instruments for the apprehension and interpretation of the external world are the peripheral sense-organs. Sensation, which marks the boundary between the animal and plant worlds, is explained by Aristotle as a form of motion, viz. a qualitative change[3] (ἀλλοίωσις) in a sense-organ. The sense-process and the sense-object are one in the actual sensation. Sound and hearing, for example, although notionally distinct, are identical in the act of sensation.[4] The sense-organ is potentially what the sense-object is actually. To make a further use of Aristotle terminology, the organ assimilates the significance or form of a thing without its matter.[1] Life rises above the uncon scious process of nutrition, when in sensation the extern world is transformed into a conscious world, a world meaning. The sense receives an impression or picture of a object, as wax receives an impression of a seal-ring witho the bronze or gold of the ring.[2] The sense is thus, in a wa identical with the object; it differs from the object, how ever, in its mode of being. The sense apprehends a qua tative element belonging to an individual,[3] but not t individual as such.

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[1] The organs known to us as 'lungs' were regarded by Aristotle as the right and left halves of an azygous organ. Consequently he always speaks of 'lung' in the singular. He found the organ to be actually single in certain snakes (*Hist. anim.* 508*a* 28 ff.), and when it is double the two divisions have a common outlet in the trachea. I have, however, in conformity with the demands of English speech, translated his singular by a plural. See the translation, pp. 286 ff.

[2] *De respir.* 479*a* 18.

[3] *De somno,* 459*b* 4 ; *Phys.* 247*a* 7 ; *De an.* 415*b* 24.

[4] *De an.* 424*a* 25 425*b* 26, 418*a* 1.

Sensation is a process that belongs to both soul an body.[4] The sensation itself is psychical, but its instrume is physical. The eye and vision are related to each othe as matter and form.[5] Vision consists in a certain relatio ship or condition of harmony. Excessive stimuli destro this harmony, just as the harmony of strings is destroye by striking them violently.[6]

Without contact there can be no action of one thin upon another. This law, which applies to the whole o nature, necessitates the assumption of a continuous mediu from object to subject, for there must be some sort o contact if the object of sense is to affect a sense-organ. A medium is further necessary because no sensation result when organ and object are in immediate contact.[1] The intervening medium, however, is in contact with both organ and object and transmits a stimulus from the latter to the former, without which no sensation would result. The medium is different in different senses.

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[1] *De an.* 424*a* 27, 426*a* 26, 431*b* 26.

[2] *De an.* 424*a* 19 ff. ; *De mem.* 450*a* 30.

[3] *Anal. post.* 87*b* 28, 100*a* 16 ff. ; *De an.* 424*a* 21 ff.

[4] *De somno*, 457*a* 7 ; *De sensu*, 436*a* 6 ; *De an.* 402*a* 4 ff.

[5] *De an.* 412*b* 18 ff.

[6] *De an.* 424*a* 32.

In considering the subject of sensation it is necessary to observe, in addition to the faculty itself, three conditioning factors: (1) the organ, (2) the object, (3) the medium. There are five senses, and at the beginning of the third book of the *De anima*[2] Aristotle attempts to prove that this enumeration is exhaustive.

1. Sight.

The sense of sight is the most important for life,[3] although hearing has a higher significance for purely intellectual life, because of the meaning conveyed by the spoken word.

a. The Organ of Sight.—The psychologists preceding Aristotle and contemporary with him regarded the sense-organs as composed severally of the elements, but as there were for the pre-Socratics only four elements (fire, earth, air, and water), whereas there were five senses, they were in straits about a fifth element with which to pair a fifth sense.[4] Further, they differed in the elements assigned to the several sense-organs. Plato, *e.g.*, coupled vision with fire, whereas Democritus coupled it with water. Aristotle, likewise, regards the sense-organs as composed of tl elements, and as to the constitution of the eye he agre with Democritus. The eye's power of vision is due to tl element of water in it, the organ being in constitutic analogous to the medium through which its stimulus transmitted, *i.e.* a translucent medium.[1] Hearing is due t the air immured in the inner ear. Smell is correlated wit one or both of the foregoing elements (air and water), an touch and taste are correlated, perhaps, in some speci manner with earth. The sense-organs are thus couple with their media and not with their objects.[2] The rea organ of vision is the pupil (κόρη),[3] which is within the ey and is composed of the element of water, and the best ey is the one whose proportion of water is best adjusted.[4] I order that light may penetrate to the interior, it i necessary that the eye be translucent, and water, becaus it is more easily fixed and kept in place, is better adapte to this purpose than air would be.[5] The water of whic the pupil is composed is derived from the brain.[6] Aristotl speaks of three conduits or πόροι leading from the eye to the brain, which may refer to the *ramus ophthalmicus*, *opticus*, and *oculomotorius*, although he did not, of course, regard these as nerves, of the function of which he had no knowledge whatever. The optic nerve he recognized as a duct, and noted the fact that the eye of the chameleon is continuous with the brain.[1] The term πόρος is, indeed, used later on to mean nerve.[2] The connection, however, here referred to by Aristotle is not a connection between peripheral and central organ. The duct between eye and brain serves only physiological purposes, and the connection is, strictly speaking, not with the brain at all, but only with the empty occiput and the vascular membrane surrounding the brain.[3] The brain, as has been pointed out, is not the central sense-organ. The peripheral organs of sight and hearing are not only connected with the vascular membrane of the brain, but they are also connected with the heart,[4] which is the sensory centre as it is also the vascular centre. Because the eye is connected with the brain and derives its water from that source, it is moist and cold like the brain.[5] Its power of vision is due to the translucence of its composition.[6]

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[1] *De an.* 421*b* 17, 423*b* 20; *De gener. et corr.* 322*b* 22; *Phys.* 245*a* 4.

[2] *De an.* 424*b* 22 ff.; cf. also *Hist. anim.* 532*b* 29.

[3] *Metaph.* 980*a* 21; *De sensu*, 437*a* 5 ff.

[4] *De sensu*, 437*a* 19 ff.

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[1] *De an.* 424*b* 28 ff.; *De sensu*, 438*b* 3 ff.: *De part. anim.* 647*a* 2 ff.

[2] The account of the sense-organs given in the *Parva Naturalia* (*D* *sensu*, 438*b* 3 ff.) differs somewhat from this (*e.g.* smell is correlated wit fire). The discrepancy is to be explained (cf. translation, pp. 96, 150) b the fact that in the *Parva Naturalia* Aristotle is reporting current opinion (evidently so in his description of smell as a smoke-like exhalation), or i may be accounted for by the theory (held by Torstrik, but impossible t establish) that the *De sensu* is an earlier treatise than the *De anima*.

[3] *De part. anim.* 653*b* 25; *Hist. anim.* 491*b* 21; *De sensu*, 438*a* 16; *D* *an.* 425*a* 4.

[4] *De gener. anim.* 780*a* 22; *De sensu*, 438*b* 5 ff.

[5] *De sensu*, 438*a* 10 ff. Cf. Theophrastus, *De sensu*, 39. Diogenes o Apollonia believed air to be the essential element in the composition of al the senses.

[6] *Hist. anim.* 492*a* 21, 495*a* 11 ff.

b. The Object of Sight.—The object of vision is the visible[7] and the invisible, for opposites are subject-matter of the same faculty of perception and of the same science.[1] The visible includes colour and certain phenomena which Aristotle calls anonymous, whose characteristic is brightness.[2] Colour is a qualitative accident that has the power of exciting or moving a diaphanous medium.[3] Vision consists neither in an efflux from the visible nor in an image thrown off by the visible, as the Atomists and Empedocles[4] supposed, but in the excitation of a translucent medium by means of colour and in a qualitative stimulation of the organ of vision by means of the medium so affected. The diaphanous mediates colour, and light is that which converts the potentially diaphanous into the actually diaphanous. Colour sets the actually diaphanous in motion and is mediated in the form of motion from a remote object to the sense-organ. The diaphanous is not itself visible, but the colour with which it is charged is visible. The actuality of the diaphanous is light.[5] The diaphanous as such is colourless,[6] but has the capacity of being illuminated and charged with colour. The colour constitutes its light in an accidental sense,[7] *i.e.* light is no particular colour. Light is not somatic nor the efflux of any body; it is not fire,[8] but depends on the presence of fire,[9] or is a subtle species of fire. As the diaphanous is actually translucent only in light, so colour is visible only in light. Fire, on the other hand, is visible in both darkness and light,[1] for it creates for itself a translucent medium by diffusing light. Colour, then, is a condition belonging to light, as light is a condition attaching to the diaphanous. The diaphanous belongs to water and air, the media of vision, and to some extent to other bodies,[2] but has no independent existence. It is not a substance. Colour is further defined by Aristotle as a quality of the superficies of a body in a diaphanous medium. So the Pythagoreans called colour a visible superficies. There are seven primary colours derivable from the basal colours, white and black.[3] They are: white, black, yellow, violet, green, and blue. The other sort of 'visible,' called by Aristotle 'anonymous,' consists in brightness produced by a smooth, polished surface, such as is found in certain fish-heads, scales, eyes, and phosphorescent substances.[4] This is not properly colour, but a fiery phenomenon which has the power of diffusing light and creating visibility.

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[1] *Hist. anim.* 492*a* 21, 495*a* 11 ff.; *De gener. anim.* 743*b* 35.

[2] Galen, *De usu part.* III. 12, quoted by Ogle, Aristotle *On the Parts of Animals*, p. 176, note 19.

[3] *De part. anim.* 656*b* 16.

[4] *Hist. anim.* 495*a* 4, 514*a* 18 ff.; *De sensu*, 439*a* 2, 444*a* 10; *De part. anim.* 652*b* 16, 656*b* 24; *De juvent.* 469*a* 10 ff.; *De gener. anim.* 743*b* 25, 781*a* 20.

[5] *De gener. anim.* 744*a* 5 ff.

[6] *De sensu*, 438*a* 12.

[7] *De an.* 418*a* 26, 422*a* 20, 424*a* 10.

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[1] *De an.* 411*a* 3; *Top.* 105*b* 5; *Metaph.* 1061*a* 18.

[2] *De an.* 418*a* 27.

[3] *Top.* 103*b* 31; *Categ.* 9*b* 9; *De an.* 418*b* 1, 419*a* 10.

[4] *De sensu*, 438*a* 2.

[5] *De an.* 418*b* 9, 419*a* 11.

[6] *De an.* 418*b* 28.

[7] *De sensu*, 439*a* 18.

[8] *De an.* 418*b* 14.

[9] *Top.* 134*b* 28.

c. *The Medium of Sight.*—The medium of sight is the diaphanous, viz. air and water and certain other translucent bodies.[5] They are the media by virtue of their transparency, which belongs to them not as air or water, but because they possess something in common with the eternal empyrean.[6] The medium itself is neutral and colourless, being thus adapted to saturation with and transmission of any colour. Aristotle rejects the emanation theory of colour, and resolves it into a form of movement of a medium, approximating herein more closely than his predecessors to the modern hypothesis of ether vibrations. Colour excites the pellucid element, which then transmits the colour-motion from the object to the sense-organ. This movement does not, however, consist in an undulatory process, but in a qualitative change, whose spatial propagation is not discernible,[1] and which appears to be instantaneously complete.

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[1] *De an.* 418*b* 2, 419*a* 23.

[2] *De sensu*, 439*a* 20 ff.

[3] *De sensu*, 439*b* 20 ff., 442*a* 19; cf. also translation, p. 87, note 2.

[4] *De an.* 419*a* 1 ff.; *De sensu*, 437*b* 5.

[5] *De an.* 418*b* 6.

[6] *De an.* 418*b* 7; *De sensu*, 438*a* 12.

2. Hearing.

a. The Organ of Hearing.—As the real organ of vision is composed of water, similarly the real organ of hearing consists of air.[2] Air is immured in the inner ear and is immovable there, *i.e.* it cannot be dispersed. This fact enables it to detect all distinctions in communicated motions. We hear in water, because it cannot penetrate to the congenital air,[3] but we hear through water as through any other foreign body. Aristotle ascribes hearing to fishes, but nowhere explains how they hear, although in the *History of Animals* he devotes several paragraphs to the subject of sensation in the lower animals.[4] The congenital air has its own internal movements, which account for certain phenomena of sound, such as the hearing of sound when there is no external stimulus.[5] A duct or channel leads from the ear to the rear of the brain, the occiput, which Aristotle supposed to be hollow and filled with air. This πόρος is perhaps the external and internal meatus, or possibly he considered the communication to be established by the Eustachian tube, which was known to him.[1]

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[1] *De sensu*, 446*b* 20 ff., 438*b* 3 ff.

[2] *De part. anim.* 656*b* 16 ; *De an.* 419*b* 34, 425*a* 4.

[3] *De an.* 419*b* 18, 420*a* 11 ; *De gener. anim.* 781*a* 23.

[4] *Hist. anim.* 532*b* 30 ff., 533*b* 1 ff.

[5] *De an.* 420*a* 17.

b. The Object of Hearing.—The object of hearing is sound.[2] Sound is produced by the concussion of two hard, smooth bodies, especially hollow bodies, in a medium.[3] Air or water may serve as a resisting body and emit sound, when either is so quickly and violently struck as to prevent its (air's or water's) gradual and noiseless dispersion.[4] Each of these acts then in the same way as a hard body, and the adjacent water or air serves as a medium for the communication of the sound. The qualities of sound are given in terms of pitch, the extremes of which are high and low, or acute and grave.[5] The high or acute is due to a swift motion, and the low or grave is due to a slow motion. Mere sound is noise. Voice is significant sound, produced by an animal, and accompanied by a mental image.[6]

c. The Medium of Hearing.—The medium of hearing as of sight is air or water.[7] These two media are in their own nature both colourless and soundless, but capable of transmitting colour and sound to sense-organs. The spatial propagation of sound is not instantaneous, but is discernible in time, as one can learn from the blow of an axe seen in the distance, the sound of which is perceived at an interval later.[8] For the transmission of sound the air must form an uninterrupted continuum from stimulus to organ.[9] The stimulus must not be too slight, otherwise it is not transmitted, nor too excessive, otherwise it disturbs the function of the organ.[1] Sensation demands a kind of proportion between stimulus and organ, from which there issues a normal organic process.

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[1] *Hist. anim.* 491*a* 30, 492*a* 20; *De part. anim.* 656*a* 18; *De gener. anim.* 781*a* 31.
[2] *De an.* 418*a* 11; *De insom.* 458*b* 6.
[3] *De an.* 419*b* 6 ff., 420*b* 14; *De sensu*, 446*b* 30; *De coelo*, 291*a* 1 ff.
[4] *De an.* 420*a* 7.
[5] *De an.* 420*a* 28.
[6] *De an.* 420*b* 25 ff.
[7] *De an.* 419*b* 18.
[8] *De sensu*, 446*a* 24 ff.
[9] *De an.* 420*a* 3.

3. Smell

a. The Organ of Smell.—The organ of smell is composed of air or water,[2] of the former in the case of respiring animals, and of the latter in the case of aquatic animals. In respiring animals the organ of smell has a covering, which is lifted in inspiration and is analogous to an eyelid; without inspiring, smell is not sensed by them.[3] In aquatic animals this covering is lacking, as the analogous eyelid is lacking in hard-eyed animals.[4] The nostrils, or physiological organs of smell, are passages for inhalation and exhalation, and are very mobile; whereas in the case of the ear, man has no muscular control of it, as most of the lower animals have.[5]

b. The Object of Smell.—The object of smell is the odorous and its opposite.[6] Smell is very poorly developed in man, being inferior in accuracy to that of many of the lower animals.[7] It is difficult to determine the essential qualities of smell, because of this imperfect development in man, and because smells are confused with the pleasant and unpleasant.[8] Smell is intimately connected with the sense of taste,[1] and many smells are described in terms of analogous flavours,—*e.g.* smells are called sweet, piquant, oily, harsh, pungent, terms that belong properly to taste. It is not, however, to be assumed that because a given thing has a sweet flavour it will also have a sweet smell. On the contrary, sweet-smelling objects often have an unpleasant taste and conversely. The object of smell is described as a property of the dry, while flavour is the sapid-moist.[2] That the dry property is not a smoke-like exhalation, as certain pre-Aristotelians held, is proved by the fact that aquatic animals are endowed with smell, and a smoke-like exhalation could not be transmitted in water.[3] Besides, this would resolve the odorous into a physical efflux, an explanation of sensation in general which Aristotle rejects.[4] The odorous consists in the saturation of a medium (air or water) with a sapid dry element.[5]

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[1] *De an.* 420*a* 24, 421*b* 9, 422*a* 26, 426*a* 28 ff.

[2] *De an.* 425*a* 5.

[3] *De an.* 421*b* 14, 422*a* 1; *De sensu*, 444*b* 22.

[4] *De sensu*, 443*a* 3.

[5] *Hist. anim.* 492*a* 28, 492*b* 15.

[6] *De an.* 421*b* 3 ff.; *De sensu*, 444*b* 20 ff.

[7] *De sensu*, 441*a* 1; *De an.* 421*a* 10.

[8] *De an.* 421*a* 12.

Although the sense of smell is poorly developed in man, he is the only animal that is capable of perceiving smell as fragrance, *i.e.* in an aesthetic way.[6] The lower animals have no appreciation of malodour as such.

c. The Medium of Smell.—The medium of smell is air or water.[7] Water mediates smell for the aquatic animals.[8] Man, however, and all respiring animals whose sense of smell is dependent on inspiration, cannot smell in water.[9] Although the media of smell are the same as the media of sight, viz. air and water, these are media for sight by virtue of their translucence, and for smell by virtue of their capacity to exude dry savour. By the peripatetic Theophrastus they are called transolent (*δίοσμα*).[1]

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[1] *De sensu*, 440*b* 28, 443*b* 8; *De an.* 421*a* 17.

[2] *De an.* 422*a* 4 ff.

[3] *De sensu*, 438*b* 23, 443*a* 20 ff.

[4] *De sensu*, 443*b* 2.

[5] *De sensu*, 443*a* 3 ff.

[6] *De sensu*, 443*b* 27 ff., 445*a* 1.

[7] *De an.* 419*a* 28 ff., 422*a* 2.

[8] *De sensu*, 443*a* 1 ff., 444*b* 5 ff.; *De an.* 419*a* 35, 421*b* 10.

[9] *De an.* 422*a* 2; *De sensu*, 444*b* 10 ff.

4. Taste.

a. The Organ of Taste.—Aristotle's view regarding the organ of taste is difficult to determine. He maintains the doctrine that all the senses function by means of a medium, and that sensation does not take place when the sense-object and sense-organ are in immediate contact.[2] In accordance with this doctrine he says the tongue is not the organ but the medium of taste, and yet he sometimes speaks in a popular way of the tongue as the organ of taste.[3] Strictly speaking, the organ of taste is something more internal.[4] The organ proper is within the flesh and is fitted with a conductor to the central organ or sensorium (*i.e.* the heart).[5] It is even possible that Aristotle regards the heart as the organ of taste and the tongue as at once the medium and ancillary organ.[6] It would seem, however, from his general account of the senses that they all have a medium, and that all of them have conduits from the peripheral organ to the sensory centre.[7]

b. The Object of Taste.—The object of taste is at once gustable and tangible. Taste is therefore a special form of the tactual or haptic sense. It is not perceived through the medium of a foreign body but through an anatomical medium, in which respect it differs from the senses of sight, hearing, and smell. The latter are marked by *actio in distans*, while taste and touch operate by immediate contact. This immediate contact is not the direct contact of the sense-object with the sense-organ, which is found in no sense, but the direct contact of the sense-object with our physical organism as a transmitting medium. Touch is more exquisitely developed in man than in any other creature, and taste, as a kind of touch, shares in this perfection. The gustable or flavour is the sapid-moist. Gustable juices are developed in water or in a moist element.

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[1] Cf. translation, p. 75, note 1.

[2] Cf. translation, p. 73, note 2.

[3] *De part. anim.* 647*a* 19, 653*b* 23 ff.; *Hist. anim.* 533*a* 26; *De an.* 422*b* 2 ff.

[4] *De an.* 423*a* 2 ff.; *De part. anim.* 656*b* 36.

[5] *De sensu*, 439*a* 1.

[6] Cf. Bäumker, *Des Aristoteles Lehre von den äussern und innern Sinnesvermögen*, p. 55.

[7] Cf. the notes on *duct* or *πόρος* above, under *the organ of sight.*

There is a great variety of opinions as to how these qualities originate in water.[1] Water is not to be regarded as panchymic in the sense of containing originally the germs of all flavours, as was held by Empedocles, but as primarily neutral and only potentially chargeable with flavour. It may be so charged by the processes of nature or by artificial means.[2] Flavours in the moist are especially developed under the influence of heat. The primary elements taken alone are tasteless;[3] flavour arises only in their combinations, and it is only in forms of combination that the elements are fit for food.[4] Flavour and the nutritive are closely connected, sweet being the most important flavour in growth.[1] The basal flavours are sw and bitter,[2] from which are derived the other flavo The number of flavours, like the number of colours, seven: sweet, bitter, salt, harsh, pungent, astringent, aci

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[1] *De sensu*, 441*a* 1 ff.

[2] *De sensu*, 441*b* 12 ff.

[3] *De sensu*, 443*a* 8 ff.; *Meteor.* 358*b* 18.

[4] *De sensu*, 441*b* 24 ff.; *De an.* 434*b* 19 ff.

b. *The Medium of Taste.*—As pointed out above, t medium of taste is not outside the body, yet taste opera through a medium.[4] We can, indeed, taste in water, b water in this case is not the medium: it is charged witl gustable substance and so becomes the object, not t medium, of taste.[5] The medium of taste is the tongue.[6]

5. Touch.

Touch and taste are the most fundamental and therefo the most universal of the senses, because they are necessa for the maintenance of animal life. No animal can exi without touch, and only animals can possess it. As it necessary to animal life, any stimulus sufficiently excess to destroy it, destroys not only the organ, as in the ot senses, but life itself. The other three senses, especi sight and hearing, minister to higher well-being and nish materials for intellectual life. Touch and taste of primary importance for the maintenance of phy well-being.[7] Although the sense of sight is the mos portant of our senses for higher well-being, becau the great number and variety of sensations with it furnishes us,[8] yet that man is the most highly en creature is shown more by his touch than by his sight, in which latter many of the lower creatures surpass him. Further, men of finest tactual sensibility are the best endowed intellectually.[1]

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[1] *De sensu*, 442a 2 ff.

[2] *De an.* 422b 11; *De sensu*, 442

[3] Cf. translation, p. 87, note 2.

[4] *De an.* 435a 16, 422a 9.

[5] *De an.* 422a 12.

[6] *De an.* 423a 15, 423b 17.

[7] *De sensu*, 436b 10 ff.; *De an.* 414b 2 ff.

[8] *Metaph.* 980a 21; *De sensu*, 437a 5 ff.

a. *The Organ of Touch.*—As in the case of taste it is not made clear what the organ is, so it is not made clear in the case of touch. The organ is described merely as something intra-corporeal, *i.e.* it is not the superficies of the body. This may refer to the central organ as some suppose,[2] or, as I think more probable, to some undefined and unknown peripheral organ within the flesh.[3]

b. *The Object of Touch.*—The object of touch is the tangible (ἁπτόν).[4] Aristotle's expression contains the same tautology. Tactual distinctions are such as characterize the body as body. They include warm and cold, dry and moist, hard and soft.[5] The objects of touch do not fall under a single category. The objects of sight fall under the category of colour; those of hearing under the category of sound; but the objects of touch are not reducible to this unity.[6]

c. *The Medium of Touch.*—As it is the function of touch to apprehend the qualities of body as body, so it is a corporeal medium that transmits these qualities, viz. the flesh. This sense gets its name from contact, which is possible only between bodies. The body in general is the medium of touch, and the tongue is the medium both of touch and taste.

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[1] *De an.* 421*a* 15 ff.

[2] Cf. Zeller's *Aristotle*, Eng. tr., vol. ii., p. 66.

[3] *De an.* 422*b* 22.

[4] *De an.* 434*b* 12; *De gener. et corrup.* 329*b* 8.

[5] *De an.* 423*b* 28 ff.

[6] *De gener. et corrup.* 330*a* 25; *De an.* 422*b* 32.

From the foregoing it will be seen that Aristotle hampered as he was by the lack of scientific research in physiology and physics amongst his contemporaries, struck boldly out into the *terra incognita* of psychophysics as a discoverer. His is not only the first attempt to create a psychology in any approximately scientific spirit, but it is the first attempt to formulate a psychology at all.

V.

THE COMMON OR CENTRAL SENSE.

ARISTOTLE'S conception of a 'common sense' (*κοινὸν αἰσθηττήριον*)[1] has no logical or historical connection with the Scottish philosophy of common sense. Sir William Hamilton, in his elaborate note appended to the works of Reid),[2] gives four meanings in which the term 'common sense' has been employed in ancient and modern times: 1. It was employed by Aristotle and the Peripatetics to signify sense proper, and denoted that faculty by which the various reports of the individual senses are reduced to the unity of a common apperception. 2. It has been applied not to sense proper, but to those cognitions and convictions which we are supposed to receive from nature and which all men possess in common, whereby we test the truth of knowledge and the morality of acts. This is the meaning in which it is employed in the Scottish philosophy. McCosh called it the Intuitive Philosophy, *i.e.* the philosophy which regards the common intuitions of the mind as the criteria of truth.

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[1] *De an.* 425a 14 ff.; *De somno*, 455a 21; *De long. et brev. vit.* 467b 469a 12.

[2] Reid's *Works*, edited by Hamilton, vol. ii., pp. 751 ff.

Dugald Stewart objected to the term 'common sense' on the ground of its ambiguity, and preferred to call these common convictions "the fundamental laws of human belief." Common sense, he asserts, is nearly synonymous with mother-wit, and good sense is only a more than ordinary share of common sense. These primary or intuitive truths are what Aristotle calls ultimate principles (ἀρχαί), but not principles of common sense. He says in the *Nicomachean Ethics*:[1] "What all men believe, that we affirm to be; and he who rejects this belief will advance nothing that is more convincing," which is the equivalent of the dictum: *quod semper, quod ubique, quod ab omnibus.* These universal beliefs, which Aristotle regards as the fundamental principles of human knowledge, are akin to the 'fundamental laws' of Stewart. The doctrine of the *sensus communis*, however, is quite distinct from this.

3. Common sense, when used with an emphasis on the adjective or substantive, indicates that kind of intelligence, the lack of which causes one to be accounted mad or foolish.

4. It denotes an acquired perception of the duties and proprieties expected from each member of society; a sense of public spirit, a feeling of obligation towards the commonweal. The last three meanings are all metaphorical, and do not refer to sense proper, but to certain intuitions which, like sensation, are characterized by immediacy, originality, and presumed trustworthiness. Thus we speak metaphorically of a 'moral sense,' a 'logical sense,' or an 'aesthetic sense.'

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[1] *Eth. nic.* 1173*a* 1.

Aristotle employs 'common sense' to signify a specific aspect in the psychological process of sense-perception. The act of sense-perception is not completed in the peripheral sense-organs, but only in the central sense.[1] There are, as enumerated in the previous chapter, five peripheral organs of sense: the eye, ear, tongue and throat, nose, skin and flesh. These are stimulated by objects in the outside world, which by contact with the organ work some change (ἀλλοίωσις) in it. The contact is effected through a medium which transmits a stimulus from the sense-object to the perceiving organ, and the change which the stimulus works in the peripheral organ is further transmitted by the blood or sense-duct to the *sensorium* (central organ). In every sensation three factors are to be taken into account: (1) the organ, (2) the object or thing sensed, (3) the medium of transmission. In the case of vision, as explained in chap. IV., these factors are the eye, the thing seen, and the diaphanous or translucent medium, whether the latter be liquid or atmospheric.

Every sensation presupposes these three elements: organ, object, and medium. To each of the individual senses belongs the function of apprehending a particular quality (ἴδιον αἰσθητόν).[2] In vision, only colour is sensed; in hearing, only sound; in smell, odour; in taste, flavour and in touch, the qualities of body as body (hardness, etc.). These are all sensation-qualities, but they are not percepts. By means of sight, *e.g.*, we have the sensation of green, but do not perceive an olive. An olive is a percept; green is a sensation. An olive is made up of several ideas, of hardness, taste, colour, form, magnitude, etc., and these are unified in a particular thing, and they constitute it a single concrete object. The peripheral organs of touch, taste, and sight furnish us with several ideas or qualities belonging to a concrete thing; but it is only by the unifying function of the central or common sense that these various qualities are brought together for knowledge and seen to inhere in a single object; in other words, it is only then that a percept is formed. The function of sensation, therefore, belongs to the peripheral or external senses in so far as they mediate the qualities of an object to the ***sensorium*** or common sense. *Perception*,[1] then, is one of the functions of the central sense.

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[1] *De an.* 426*b* 10 ff.; *De somno*, 455*a* 10 ff.

[2] *De an.* 418*a* 10 ff.

Again, it is by means of the central sense that we recognize particular sensations as belonging to ourselves, and can hold them up before our minds as something known to us. We know that we see. In other words, we are conscious of a sensation. *Consciousness*,[2] then, is a second function of the common sense. Locke made a distinction between what he called the external and the internal senses. The external sense gives us ideas of colour, sound, and other properties of body. The internal sense gives us ideas of thought, reasoning, memory, and the other operations of our own minds, and is another name for consciousness. This function, so far as it is limited to the consciousness of sensations and their meaning for perceptual knowledge, is ascribed by Aristotle to the common sense.

Again, there are in addition to the particular sense-qualities (*ἴδια αἰσθητά*), such as odour, sound, colour, etc., certain properties attaching to things which Aristotle cal 'common sensibles' (κοινὰ αἰσθητά).[1] These are rest, motio number, shape, and magnitude. They are called 'common because their apprehension does not belong directly to an particular sense (although they are perceived indirectly b each), and because they are cognized directly by the commo sense. They differ from primary or simple sensibles i having no specific sense-organ. This is a third function o the *sensorium commune*. Again, the individual sense furnish us with colour, sound, etc., but it is not their functio to discriminate, *e.g.*, between sweet and white, or to differentiate degrees of bitter. This is a function of *judgment*,[2] an it is ascribed by Aristotle to the common sense. The discrimination between true and false, between real an unreal in our perceptions is made not by the periphera senses, but by the central sense. The sensation, because i is only a fact and as a sense-process pronounces no judgment, is always true,[3] but when the sensation is predicate of something and a judgment is expressed. error is possibl It is the internal or central sense that performs this offic of judgment in the sphere of perceptual knowledge, and i is, therefore, to the central sense alone that, strictly speaking, truth and falsehood in this sphere can be ascribed.

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[1] *De sensu*, 449*a* 3 ff.

[2] *De an.* 425*b* 12 ff.; *De sensu*, 455*a* 15 ff.

Further, sleep,[4] imagination,[5] memory,[6] and dreams,[7] i so far as they signify the interruption of consciousness o the continued life and movement of residual sense-percep tions, are functions of the sensorium. In summary, these various functions of the central or common sense are as follows: 1. The unification of the primary sensibles, or the complete act of sense-perception; 2. Consciousness; 3. The suspension of consciousness, or sleep; 4. The cognition of the 'common sensibles,' magnitude, number, etc.; 5. Judgment, in so far as judgment applies to the comparison, contrast, and discrimination of the deliverances of sense; 6. Imagination, or residual sense-images; 7. Memory (including reminiscence), or the voluntary and involuntary reproduction of sensations; while lastly, 8. its content is the potentiality of reason.

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[1] *De an.* 418*a* 17, 425*a* 16; *De mem.* 450*a* 10. Cf. translation, p. 9 note 2.

[2] *De an.* 426*b* 14 ff.

[3] *De an.* 427*b* 11, 428*a* 12.

[4] *De somno*, 454*a* 23, 456*a* 1.

[5] *De insom.* 460*b* 17.

[6] *De mem.* 451*a* 17.

[7] *De insom.* 458*b* 1 ff.

As the peripheral senses have an object, a medium, and an organ, so also has the central sense. The objects are the 'common sensibles' and the several particular sensations which are unified by the central sense into the perception of a single concrete thing; the medium is the blood and the particular sense-organs; and its own organ is the heart.[1]

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[1] *De Juvent.* 467*b* 28 ff., 469*a* 11. Aristotle's reasons for rejecting the brain as the sensory centre may be summarized as follows: 1. The brain of a living animal appears to be insensible to touch (*Hist. anim.* 520*b* 16). 2. Aristotle was unable to discover any brain in the invertebrates, excepting the Cephalopods. The ganglia in other invertebrates, owing to his lack of instruments, escaped his notice. 3. The peripheral organs (eye, ear, and nose) are not, strictly speaking, connected with the brain, but only with the vascular membrane surrounding it. 4. The sense-ducts are connected with the heart, from which radiates the entire vascular system. 5. The heart is the *primum vivens, ultimum moriens* (*De part. anim.* 666*a* 20, 667*a* 20 ff.; *De juvent.* 468*b* 28) in animal life, and as sensibility is the most fundamental animal characteristic, so the heart would appear to be the most fundamental organ of this characteristic. 6. With loss of blood sensibility is lessened. 7. The heart's action is plainly affected by pleasure and pain. 8. Its central, acropolis-like position indicates that nature's economy intended the heart to be the organ of government.

VI.

IMAGINATION AND MEMORY.[1]

THE process of knowing, according to Aristotle, develops in three different stages: 1. The primary stage or simplest form of knowing is sensation (αἴσθησις); 2. The second stage is imagination (φαντασία), or the power of using images of absent objects; 3. The third stage is rational thought (νοῦς). Although imagination differs from sensation and conceptual thought, it is not possible without sensation; and thought, in turn, is not possible without imagination. Imagination is the persistence of a sense-impression after the removal of the sense-stimulus, described by Hobbes as "decaying sense,"[2] and by Aristotle as a weaker[3] or less clear sense.

Imagination mediates between sensation and thought. Sensation furnishes the mind with a body of impressions and copies of the external world,—the raw material which imagination and thought employ.[4] Imagination is a storehouse, as it were, of copies of sense-objects, which persist in the mind as images after the seen or heard objects have been removed. I no longer hear, *e.g.*, the song that once stirred my sense, yet it sings and repeats itself in the auditory imagery of my mind. I no longer see the player distraught with the woes of Oedipus, yet the picture of his tragic face remains in my life of visual imagination. In this meaning, imagination is the power to hold the impression of sense after the sense-object has gone. Sensation refers to a present impression; imagination refers to an impression of something that is no longer before us. Imagination is necessary, therefore, to the life of thought and memory, for without it mind would be only the ever-shifting scene of kaleidoscopic sense-impressions which, once gone, could never be revived. Imagination partakes of the nature of both thought and sensation; like thought, it is a subjective, internal activity; and like sensation, it is the passive receiver of images and forms from the external world.

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[1] See translation, pp. 110 ff.

[2] "Imagination therefore is nothing but decaying sense," Hobbes' *Leviathan*, Part I., ch. 2, p. 7. Oxford, 1881.

[3] *Rhet.* 1370*a* 28.

[4] Aristotle's distinctions between imagination and sensation are more minutely given in note 1, translation, p. 110.

The word *φαντασία* is used by Aristotle to mean both the faculty of imagination and the product of imagination. For the latter meaning, however, he ordinarily employs the word phantasm (*φάντασμα*). There are three more or less distinct senses in which Aristotle makes use of the term phantasm: 1. Appearance; 2. Phantasm or false appearance; 3. An internal mental picture of an absent sense-object. It is in the last meaning that the term is usually employed in his psychological treatises. The word *φαντασία* is akin to *φάος* ('light'), and *φαντάζεσθαι* ('to appear'); and there is in the word an implied distinction between the phantasm and the real; it is appearance *versus* reality. Yet while the image is not the real thing but only the real thing's form, it may be a true copy of the real, and, as such, it is as true as sensation. The two prominent elements expressed in the word, looked at etymologically, are form and light, without

which the sensible world is not revealed to us. As the
reveals to us an external world of form and light,
phantasy reveals to us an inner world of forms, colo
perspective, and light,—an inner world corresponding
its imagery to the world of lighted space.

The psychophysical process by which imagination
produced is conceived by Aristotle as follows: Sensatio
due to a movement set up in the sense-organ by a pres
stimulus. This movement has the power to persist af
the stimulus has been removed. Just as one throws
pebble into the water and sets up a circular movem
therein, and this moving circle creates a second by
energy, even after the pebble has disappeared, and
second circle in turn communicates its movement to a thi
growing fainter the while, so a sense-stimulus sets u
movement in the sense-organ, which in turn communica
its movement to the blood, and the blood, under favoura
circumstances, conveys it to the heart, which is the org
of consciousness and of the higher activities of the mi
By favourable circumstances Aristotle means cases wh
the movement is not inhibited or interfered with
counter-movements of sensation, and where the sensat
is strong enough to persist. In the midst of the cro
currents of our motley life of sensation, the movements
up by given stimuli are constantly crossed and impeded
other movements, and there arises amongst them, as it we
a struggle for existence, to employ a much used formula
modern biology.[1] Those movements which at the mom
are strongest, reach the heart and become phantasms;

[1] *De insom.* 461*a* 1 ff.; *De an.* 428*b* 10 ff.

conscious images. Similarly also to the fainter expression of the communicated movement in the illustration drawn from the pebble,[1] the communicated movement in the phantasm is fainter than that in the original sensation.

In a passage in the *Rhetoric* already referred to, Aristotle describes a phantasm as a "weak sensation," which is very like the view of Hobbes, who says: "All fancies are motions within us, reliques of those made in the sense."[2] These movements of the imagination are, as one might expect, especially characteristic of sleep, during which the sense-activity is suppressed. Dream-images are not always copies of the real world, but often merely a mass of confused, distorted forms having no apparent relation to actual things. Imagination, therefore, has two forms: (1) That of revived or residual sense-perceptions, *i.e.* copies or images of the real world, in which the imagination is passive or receptive; (2) That of reconstructed or created images, in which the imagination is active and productive. The one form of imagination is called by Aristotle *φαντασία αἰσθητική*, the perceptual or reproductive imagination, and the other form *φαντασία λογιστική*, the constructive or productive imagination.[3] The latter belongs only to man, the former to the brute creation as well as to man. Furth the imagery accompanying general notions and conc tual thought is a creation of the productive imaginati The latter form of imagination is due to a free initiati power in the central organ, which may take the charac of a logical construction of the elements of sense-imag into a coherent complex, such as is exhibited in a creati of literary or plastic art; or it may take the form arbitrary, incoherent, confused image-masses, as exhibit in sleep, in the delirium of fever, or in the excitement vehement desire or violent passion. Such distortions a malformations, corresponding to no real things, are d mainly to physiological causes, especially to excessive h and disordered movements in the blood. They oc mostly in sleep, because the activities of thought a sensation, which act as regulators of imagination by d are suppressed in sleep, and, consequently, the activities imagery have then complete control of the central org These phantasies, uncontrolled by waking consciousn resemble the imagery of clouds, which, as Aristotle say at one moment represent a centaur, at another a man, a are constantly shifting in their forms. Melancholy h great influence in the production of pictures of phanta because it generates excessive heat in the central organ; also have such pathological conditions as are found ecstasy and madness, observable in the case of sibyls a religious maniacs, in whose minds the pictures of fancy a regarded as real objects. In these cases right judgme

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[1] *De insom.* 461*a* 20 ff. and note 1, translation, p. 242.

[2] *Leviathan*, p. 12 (Part I., ch. iii). Cf. Freudenthal, *Ueber den Begriff des Wortes φαντασία bei Aristoteles*, p. 24.

[3] In modern psychology imagination and thought are less differentiated than in Aristotle's writings, where imagination is always either the reproduction of sense-elements or their reconstruction into new images, without loss of their sensuous or picture character. Of constructive imagination Titchener says: "It is a 'thinking' or judging not in words but in reproductive ideas. Psychologically, then, there is no difference between the 'imagination' of the poet and the 'thought' of the inventor" (*Outline of Psychology*, p. 297).

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[1] *De insom.* 460*b* 12, 461*b* 20; *Metaph.* 1024*b* 22; *Prob.* 9953*a* 10 957*b* 10 ff.

which normally assists in the regulation of the image-making function, is inhibited. Imagination, then, is for Aristotle both an image-receiving and an image-producing power.[1] As an image-receiving or image-holding power, it is the source of memory and recollection. This is the reproductive function of imagination. A memory or memory-image differs from a phantasm in two particulars: (1) memory regards the phantasm as a copy of something, while imagination regards it simply as a picture; (2) memory regards the thing, of which the phantasm is a copy, as having been seen or known by us. It is recognized as part of a past experience.

The deliberate and conscious calling up of this copy is recollection (*ἀνάμνησις*). Recollection depends on the original coherence of the movements or elements in experience. By virtue of this original coherence one image i called up by another formerly connected with it. The law of association in memory[1] are described by Aristotle a (1) similarity, (2) contrast, (3) contiguity.[2]

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[1] That Aristotle employs imagination in these two senses is, I think, demonstrable. The terms above cited, *φαντασία αἰσθητική* and *φαντασία λογιστική* (*De an.* 433*b* 29), are thus most consistently explained. Further, in the aims of art and the ends of conduct Aristotle employs imagination in the constructive or productive sense (*De poet.* 1455*a* 22 ff.; *Eth. Nic.* 1138*b* 20 ff.), and he sharply distinguishes between the sense-imagination of the lower animals and the rational employment made of it by man (*De an.* 434*a* 6, 429*a* 1 ff. Cf. Frohschammer, *Ueber die Principien der aristotelischen Philosophie*, pp. 52 ff.; and Teichmüller, *Aristotelische Forschungen*, Vol. II., pp. 149 ff.). Again, it is possible to call before the mind an imaginary object, a new and more or less arbitrary construction, which is not possible in reproductive imagination or in discursive thought controlled by rigid laws of procedure (*De an.* 427*b* 15 ff.). Butcher, although he denies that Aristotle employed the term in a productive sense, yet in his account of phantasy implies (correctly, I think) that Aristotle did use the term in this meaning (*Aristotle's Theory of Poetry and Fine Art*, pp. 126 ff. and Preface, p. viii. Cf. also Freudenthal, *op. cit.*, pp. 31, 45). It is not to be supposed, of course, that Aristotle thinks of two imaginations, but merely of two functions of this psychological power—the one concerned with the reproduction of sense-elements, and the other with their logistic or rational reconstruction into new forms.

Productive or active imagination, on the other hand creates images that do not correspond with past experience or sensations, but which have only an ideal or subjectiv existence. These images are the phantasies of dream-lif of delirium, of art-creation, etc. It is to the imaginatio that art appeals. The image-making power is the subjective source of art imitation (μίμησις). It is the functio of imagination to clothe the idea in a picture or figure space and thus to mediate between the outward work o art and the internal idea. Art, in Aristotle's opinion, is essentially mimetic. Imitation in art is, in the first place, an imitation of a picture in the phantasy. Measured alongside the work of art, the mental picture or phantasy is an abstraction. The work of art is the concrete ideal, and here phantasy is active and creative. The mental image itself, however, is either a mimetic picture of the sensible real or it is a purified picture of the sensibl real. When art is not merely mechanically reproductive or crudely mimetic, but is the purified or cathartic pictur of the real, then (Aristotle says) poetry is more philosophical and more serious than history.[3] History is particular; poetry and art are universal, idealistic.

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[1] Aristotle says that experience, which is akin to science and art, i derived from 'much memory' (*Anal. post.* 100*a* 5; *Metaph.* 980*b* 29). Cf Hobbes' *Leviathan* (ch. ii., Part I.), p. 7: "Much memory, or memory o many things, is called experience."

[2] *De mem.* 451*b* 10 ff.

[3] *De poet.* 1451*b* 5 ff.

The relation between phantasy and artistic genius is nfortunately scarcely more than touched upon by Arisotle. Imagination is the normative and directing power n art, because it is imagination that places before the rtist the end he wishes to attain, and this end is given n the form of a mental picture or image. The art-object xists in phantasy prior to its existence in reality. The reations of art are the projections of internal phantasms into the various forms of art-expression,—into the form of fixed and arrested matter (sculpture and architecture),[1] or into the form of fluent, rhythmic verbal symbols (poetry), or coloured superficies (painting), or melodious sequence of sounds (music). In every instance art is concerned with appearances (*φαντάσματα*), and is, therefore, always sensuous. It is clothed exclusively in imagery drawn from the sense-world, even the rhythm of poetry being an imitation of aesthetic movement in a world of sensible motion.

The final function of imagination, in Aristotle's account, is to supply the schematic form in which the higher activities of conceptual thought are clothed. The reason needs general images for the schematism of general notions, and such schemata are supplied to νοῦς by the productive imagination. Furthermore, imagination mediates the sense-world to the reason, and thought interprets the imaged world of sense in the forms of science and philosophy.

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[1] Architecture is not included amongst the fine arts by Aristotle, because t serves practical ends and its primary purpose is not to minister to the esthetic emotions, and further because of its non-imitative character. Cf. utcher, *Aristotle's Theory of Poetry and Fine Art*, pp. 146 ff.

VII.

PRACTICAL REASON AND WILL.

THE practical reason differs in its function from the theoretic reason. These are not two reasons, but one reason operative in two distinct fields, viz. in the field of knowledge and in the field of morality; and as the subject-matter and results in the two cases differ, so the two functions have received different names. The function of the theoretic reason is to discriminate between the true and the false; the function of the practical reason is to discriminate between the good and the bad.[1] The former knows; the latter judges, weighs, evaluates, advises, and determines. The practical reason is concerned with deliberation and conduct, with knowledge as applied to action; the theoretic reason is concerned with knowledge as such. The theoretical reason gives no commands. The practical reason operates in the form of a practical syllogism, whose conclusion is epitactic or imperative.

Aristotle describes this syllogism as follows: All deliberate action is resolvable into a major and minor premiss, from which the given action logically issues. The major premiss is a general conception or moral maxim; the minor premiss is a particular instance; and the conclusion is an action involved in subsuming the particular instance under the general conception or law. The conclusion is not an abstraction, as in the case of a theoretical syllogism, but consists in an action and is jussive, *e.g.*[1]

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[1] *De an.* 431*b* 10, 433*a* 14, 434*a* 16; *Eth. nic.* 1144*a* 31 ff., 1147*a* 1 ff.; *De motu anim.* 701*a* 7 ff.

Major premiss: All men should take exercise;
Minor premiss: I am a man;
Conclusion: I should take exercise;

Or,

Light meats are wholesome,
This is a light meat,
∴ It is wholesome.

Our English phrase 'acting on principle' is, as Grant pointed out, the equivalent of Aristotle's practical syllogism.[2] The practical syllogism operates in the sphere of conduct, of choice and the variable[3] (τὰ ἐνδεχόμενα ἄλλως ἔχειν), not in the sphere of necessary truth as is the case with the speculative reason, whose aim is demonstrable truth, whereas the aim of the practical reason is the good, the prudent, the desirable. The content of the conclusion as knowledge is the essential matter for the former; the content of the conclusion as motive is the essential matter for the latter. The main business of the former is with the understanding, of the latter, with the will; the principle of 'sufficient reason' is related to the understanding as the principle of 'final cause' or motive is related to the will.[4] In the practical syllogism obligation is vested in the conclusion, and the particular or minor premiss is more cogent than the major, *i.e.* it is not the general law, but the application of the general law to a particular person, that stimulates to action.[1]

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[1] *De motu anim.* 701*a* 27; *Eth nic.* 1141*b* 18 ff.

[2] *The Ethics of Aristotle*, edited by Sir A. Grant, 3rd ed., London 1874, Vol. I., p. 269.

[3] *Eth. nic.* 1140*a* 32 ff., 1141*a* 1 ff.

[4] Cf. Grant, *op. cit.*, p. 263. Also *De an.* 432*a* 10 ff., translation p. 132.

The virtue characteristic of the practical reason is prudence or practical insight (*φρόνησις*). "Prudence is neither a science nor an art; it cannot be a science because the sphere of action is that which is variable; it cannot be an art,[2] for production is generically different from action;"[3] and although Aristotle rejects the Socratic doctrine that virtue is knowledge (the sphere of moral life is pleasure and pain, rather than knowledge),[4] he goes on to say that the "presence of the single virtue of prudence implies the presence of all the moral virtues."[5] Prudence, however, is not itself the whole of moral virtue: "moral virtue makes us desire the end, while prudence makes us adopt the right means to the end."[6] Although men act on general principles and laws, they do not perform general acts; all acts are particular; and so Aristotle, in describing the practical reason and its characteristic moral quality of prudence, further differentiates it from the theoretic reason by saying it is concerned immediately with particulars (*αἴσθησις, ἔσχατον, πρακτὸν ἀγαθόν, τὸ καθ' ἕκαστον*).[7]

The jussive character of its conclusion is, indeed, derived from the major premiss, but only by applying the major premiss to a particular instance. The empirical knowledge of particular facts is more immediately important. "Prudence [1] does not deal in general propositions only, but implies knowledge of particular facts also; for it issues in action, and the field of action is the field of particulars. This is why some men who lack scientific knowledge, especially men of wide experience, are more efficient in practice than others that have such knowledge. Prudence is concerned with practice and needs both general truths and particular facts, but more especially the latter." [2] It is the particular or minor premiss that is most cogent in stimulating to action. The minor premiss, however, is immediately perceived and often obvious, and the practical syllogism then has the form of enthymeme.

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[1] *De an.* 434*a* 17.

[2] Human activities are classified by Aristotle into three main groups: (1) knowledge, (2) action, (3) production (art). To these three groups of activities he assigns the following corresponding forms of science: (1) theoretic, (2) practical, (3) poetic. Cf. *Metaph.* 1025*b* 20 ff.

[3] *Eth. nic.* 1140*b* 1 ff.

[4] *Eth. nic.* 1104*b* 9.

[5] *Eth. nic.* 1145*a* 1 Peters' translation (4th ed., London, 1891), Bk. VI., 13, 6.

[6] *Eth. nic.* 1145*a* 5 (Bk. VI., 13, 7).

[7] *Eth. nic.* 1141*b* 16, 28, 1142*a* 22, 1142*a* 25-30.

The epitactic quality of the practical reason is not thinkable apart from the virtue of the will. It can legislate, but not execute. Volition is not vested in it, although no moral volition is possible without it. However, as a legislative power it guides the will by enlightening it.

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[1] Walter identifies practical reason and prudence, and regards the doctrine of a *νοῦς πρακτικὸς* as a late interpretation of Aristotle, due to an incorrect translation of Albertus Magnus. Walter's distinctions, although very acute, seem to me not only unprofitable refinements, but of questionable hermeneutic soundness. The fact that the process here referred to is described by Aristotle as syllogistic and issuing in conduct (*De an.* 433*a* 1-16), and the frequent reference to practical reason as a distinct psychological power (*πρακτικὸς νοῦς*, *De an.* 433*a* 16, *Eth. nic.* 1142*a* 25-30; *διάνοια πρακτική*, *De an.* 433*b* 18, *Pol.* 1325*b* 18; *λόγος πρακτικός*, *Pol.* 1333*a* 25), seem to show that Aristotle regarded this not only as different from the theoretic function or reason, but also as different from *φρόνησις* (prudence) as a moral quality. Cf. Walter, *Die Lehre von der praktischen Vernunft*, Jena, 1894, pp. 15 ff.

[2] *Eth nic.* 1141*b* 15 ff.

By will Aristotle understands any effort towards the go The lowest form of will is impulse; its highest form rational desire.

Aristotle, like Plato, developed his ethical doctrines the closest connection with his psychological theories. H conception of the moral will and its function is determin largely by his theory of the practical reason. In h analysis of the elements of consciousness, he finds only wh we should call ideational and affective elements. Th is no reference to any third conative element. The t component elements in the ethical will are practical reas and desire (ἐπιθυμία, ὄρεξις).[1] Desire, as Aristotle employs is not a purely pathic or affective element. Feeling as su (theoretically) is completely passive,—mere enjoyment the pleasant or mere suffering of the painful. Aristot however, describes desire as an effort towards the attai ment of the pleasant, *i.e.* he includes in it an activity or conative element. It is feeling with an added quality impulse (*Trieb*). More specifically and in detail the elemen contained in it are: (1) An idea or presentative elemen There can be no desire without cognition or imaginati (ὀρεκτικὸν δὲ οὐκ ἄνευ φαντασίας).[2] An animal cannot desi that of which it has no image. (2) An element of feelin In every desire or aversion there is an element of pleasu or pain.[3] (3) An element of effort or activity.[4] Desi involves pursuit or avoidance, and in it is given a spri of action. The object of desire is the motive in conduct.[1] The pleasure that is felt or anticipated is the object of effort and the initiator of movement, and it is through desire that the practical reason operates indirectly on actions. "Mere reasoning never sets anything in motion, but only reasoning about means to an end or practical reasoning,"[2] *i.e.* reasoning which guides or modifies the desires.

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[1] *De an.* 432*b* 6 ff., 433*a* 2 ff., 414*b* 5, 433*a* 1—433*b* 30, 431*a* 12: *De* 454*b* 31; *Eth. nic.* 1094*a* 21, 1139*a* 22, 1111*a* 32 ff.

[2] *De an.* 433*b* 28.

[3] *De an.* 413*b* 23, 434*a* 3; *Eth. nic.* 1175*b* 27.

[4] *De an.* 433*a* 9-21; *Eth. nic.* 1111*b* 17, 1139*a* 22.

This deliberative process of the practical reason, issuing in an imperative conclusion and combined with desire, constitutes for Aristotle the moral will. The reason alone does not produce action, and the desire alone is non-rational and non-moral. Aristotle, therefore, defines the moral will (*προαίρεσις*)[3] as desire penetrated by reason, or reason stimulated by desire (*ὄρεξις διανοητική, νοῦς ὀρεκτικός*).[4] The practical reason contains a jussive force and rightness, while desire supplies an active, appetitive quality. The moral will, therefore, is a complex of reason and desire, and is supposed by Aristotle to function under the following modes: (1) deliberate choice; (2) purpose; (3) freedom; (4) fixed habit. By means of particular acts issuing from free and deliberate choice is generated the individual's moral character, which Aristotle describes as fixed habit (*ἕξις*)[5] or the persistent will.

Aristotle maintains the freedom of the will, and says it is in our power to be "worthy or worthless."[6] This, he argues, is attested by our own consciousness of power to do or to refrain, by the common testimony of men, by the rewards and punishments of rulers, and by the general employment of praise and blame. Particular acts are always in our power, and we are responsible for them,—we may not contend that because they are determined by temperament or character, they are not free and we are not responsible.[1] "We are masters of our acts from beginning to end, when we know the particular circumstances; but we are masters of the beginnings only of our habits or characters, while their growth by gradual steps is imperceptible, like the growth of disease. Inasmuch, however, as it lay with us to employ or not to employ our faculties in this way, the resulting characters are on that account voluntary."[2] In a certain sense we are creators of our own determinism, paradoxical as this may sound. Aristotle says in the *Topics* that man is determined in the sense that "a man's destiny is his own soul,"[3] although its character is his own voluntary creation. It is true that by voluntary particular acts a man becomes voluntarily just or unjust, "but it does not follow that, if he wishes it, he can cease to be unjust and be just, any more than he who is sick can, if he wishes it, be whole. And it may be that he is voluntarily sick, through living incontinently and disobeying the doctor. At one time, then, he had the option not to be sick, but he no longer has it, now that he has thrown away his health. When you have thrown a stone, it is no longer in your power to call it back."[1]

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[1] *De an.* 433*b* 11.

[2] *Eth. nic.* 1139*a* 36.

[3] *Eth. nic.* 1106*a* 3, 1113*a* 11 ff., 1139*a* 31, 33, 1139*b* 4; *De mot. anim.* 700*b* 23.

[4] *Eth. nic.* 1139*b* 4, 1102*b* 30.

[5] *Categ.* 8*b* 28, 9*a* 5; *Eth. nic.* 1106*a* 22, 1105*b* 25, 1157*b* 31.

[6] *Eth. nic.* 1113*b* 14.

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[1] *Eth. nic.* 1113*b* 5 ff. (Bk. III., ch. 5).

[2] *Eth. nic.* 1114*b* 26 ff. (Peters' translation, 4th ed., London, 1891, Bk. III., ch. 5, end).

[3] *Top.* 112*a* 38, *ταύτην* (sc. *ψυχὴν*) *γὰρ ἑκάστου εἶναι δαίμονα.*

In the foregoing I have had regard only to the moral will. In a general sense, however,—perhaps akin to Schopenhauer's conception,—Aristotle employs the term ἐνέργεια (all organic effort) as will. This form of will or activity is, in his teleological view of the world, impulse to the good or a striving towards self-realization, whether in plant or animal. It manifests itself in psychical life in such various forms as nutrition, locomotion, sensation, and rational activity. The whole of psychical or organic life, therefore, is regarded from the standpoint of will or activity tending designedly towards the realization of a given potentiality. But will in the moral sense, the *voluntas intellectiva* of Thomas Aquinas and the will of modern ethics, is rationalized desire or feeling acting under forms imposed by reason.

VIII.

CREATIVE REASON.[2]

ARISTOTLE'S account of the theoretical activity of reason is very meagre,—wholly inadequate for any reconstruction that is not speculative and tentative. Even the learned commentator Themistius says regarding the doctrine of the active reason: "The philosopher himself (*i.e.* Aristotle) is here more like a puzzled inquirer

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[1] *Eth. nic.* 1113*b* 14 ff.

[2] This chapter is reprinted (with slight changes) from the *Philosophical Review* (Vol. XI., No. 3, May 1902).

(ἀπορoῦντι) than a teacher."[1] And Theophrastus, who succeeded Aristotle as Scholarch of the Lyceum and was intimately instructed in the Peripatetic doctrines, although he accepted the theory of a twofold reason (active and passive), was unable to explain it. How the reason could be at once native to man and yet enter from without, and how potentiality is related to actuality in reasoning, were difficulties which Theophrastus, as reported by Themistius,[2] regarded as serious, if not insoluble. Thus the question regarding the nature of the active reason[3] early became a matter of controversy, and it has continued a fruitful source of polemics among the Syrians, Arabs, and Christians for well-nigh two millenniums.

Eudemus explained the active reason in us by saying that it is God (not θεῖον but θεός) in man (cf. *Eth. Eud.* 1248*a* 24). Similarly, Alexander of Aphrodisias (called Aristotle's exegete *par excellence*), who held a pantheistic view of the world, regarded the creative reason as the activity of the divine intelligence.[4] The Syrians and Arabs were greatly influenced by Alexander. Avicenna, however, interprets the doctrine in terms of an emanation theory of the world, akin to Neo-Platonism. Intelligible forms are endowed with immaterial pre-existence in pure spirits, the highest created intelligences. From the highest they pass into a second sphere, from the second into a third, and so on down into the last, which is the creative reason (*intelligentia agens*). From this creative (cosmic) reason intelligible forms pass into the soul, on the one hand; as substantial forms they pass into material things, on the other hand. Subject and object are thus reconciled by means of the forms (*intelligible* for reason and *substantial* for concrete things) which emanate from a common source, viz. the creative reason. The substantial form, *i.e.* the class-notion immanent in sensible particulars, is correlated with the intelligible form, *i.e.* the concept immanent in reason, and therefore knowing subject and known object are only different aspects of one reality. Subject and object are unified in the creative reason. The passive reason, by means of phantasms or images, is able to apprehend the substantial forms (*genera*), and from the active reason it receives the light of intelligible forms (concepts). The intelligible forms from the active reason are combined in the passive reason with the sensible forms, and erected into the structure of empirical science. Every act of knowing implies receptivity from this dual source of emanated forms—intelligible and substantial forms: a curious mixture of Aristotelianism with Neo-Platonism.

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[1] Themistius, *Comm. in Arist. lib. de anima*, fol. 71*b*.

[2] Themistius, *Paraphrasis librorum de anima*, ed. Spengel, pp. 189, 8; 198, 13. (On *De an.* III., 5.)

[3] The term νοῦς ποιητικός occurs nowhere in the writings of Aristotle, but the equivalent is given in τὸ ποιητικόν and τὸ ποιεῖν πάντα and by implication in the antithesis to νοῦς παθητικός. Cf. *De an.* 426*a* 4, 430*a* 12, 430*a* 24.

[4] Cf. Brentano, *Die Psychologie des Aristoteles*, Mainz, 1867, p. 7.

Averroës, the foremost Arabic exegete of Aristotle, and one of the most important intellectual figures of the Middle Ages, regards both the active (*intellectus agens*) and the passive reason (*intellectus materialis*) as spiritual entities distinct from the body and from each other. The former's activity consists in making sensible images intelligible, and thereby moving the passive reason. The passive reason receives the phantasms which have been illuminated and made intelligible by the active reason. This dual reason (consisting of two separate entities) is the eternal in man; while the other powers that are concerned with the particular originate with the body and perish with the body. In the interpretation of Avicenna, on the contrary, only the creative reason is eternal; while the passive reason, depending on the life of sense-experience, perishes with the body. In the interpretation of Averroës, although the reason is immortal, individuality ceases with death; for differences in individuals are due to differences in their accumulated sensible images and phantasmata—in the content of their experience. Rational activity, as such, is universally the same, and it is only this universal, non-individual principle of reason that persists after death. All individuals are alike in participating in one rational life, and they are different in so far as reason has a different mass of images to illumine. The principle of individuation is in plastic matter, not in generic form, and reason is related to sensible images as form is related to matter.

Trendelenburg,[1] in the commentary to his edition of the *De anima*, explains the passive reason as the sum of all the lower cognitive faculties, including the power of sense-perception. It is passive because it stands in the relation of receptivity to the object of cognition and is affected by it. The completion of its processes is, however, obtained only through the agency of the active reason. The derivation of the universal notion from particular sensations is a function of the passive reason, in so far as the universal notion is regarded as part of the mind's content. The creative reason furnishes the ultimate principles of knowledge, *i.e.* it contains and applies the standard of truth and falsity in the conceptual world as the 'common sense' passes judgment on the true and false in perceptual reality.[1] The creative reason is not the divine spirit (although it is related to the divine), but belongs to the individual, and is not the same in all men. The relation between the divine spirit and the creative reason in man is nowhere explained by Aristotle, beyond his saying in the *Metaphysics* that they are analogous principles.[2]

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[1] Cf. Commentary on *De an.* III., § 5, 2 ff.

Ravaisson, in his *Essai sur la métaphysique d'Aristote,*[3] says that the individual man, according to Aristotle, has only passive reason, which as the potentiality of all forms and ideas is analogous to primary matter. It is the universal potentiality in the world of ideas. On the other hand, the creative activity which actualizes possible forms and produces all thoughts is the absolute reason. The sensible and the passively rational are fundamentally the same; both exist in a single consciousness, and are operated on by the active reason. The entire passive reason (and so all individuality) is mortal. The creative reason is conceived by Ravaisson in the same way as by Alexander of Aphrodisias. Renan[4] regards Aristotle's conception of the creative reason as similar to Malebranche's theory of seeing things in God,—a conception suggested to Aristotle, perhaps, by the Anaxagorean doctrine of Nous.

[1] Cf. Aristotle, *De insom.* 461*b* 2 ff.

[2] *Metaph.* 1072*b* 18 ff.

[3] Vol. I., pp. 586 ff.

[4] Brentano, *op. cit.*, p. 34.

[illegible] considers the passive reason to mean the "su
[illegible] of representation which go beyond ima
[illegible] sensible perception, and yet fall short of
[illegible] thought which has found peace in perfect
[illegible] It does not include the powers of s
[illegible] as Trendelenburg thinks. nor is it ide
[illegible] fancy as the seat of mental pictures," as Bre
[illegible] Von Hertling, in calling the passive r
[illegible] cognitive faculty of the sensitive part,"[3] w
[illegible] seem to identify it with the *sensus comm*
[illegible] rejects these and all other explanations of Arist
[illegible] and wholly abandons the reconciliation o
[illegible] reason in one personality. He further cons
[illegible] unjustifiable, even in Aristotle's own theo
[illegible] the term *nous* to the 'passive reason.' Reaso
[illegible] is in its essence "a single immediate apprehe
[illegible] intelligible reality, constituting one indivisible a
which it is not possible to interpret in terms of Arist
[illegible] theory.

Wallace, whose interpretation of Aristotle is some
coloured by English Hegelianism, says: "Aristotle w
seem to mean that while our intellectual powers are o
one hand merely receptive—while they merely elab
and, by processes of discursive thought, systematize
materials of thought—these materials of thought
become so, only get formed into an intelligible worl
an act of reason which has gone on from the creati

Zeller's *Aristotle*, Eng. tr., Vol. II., p. 102.
Zeller, *op. cit.*, II., p. 103. [3] Von Hertling, *Materie und Form*, p
Zeller, *op. cit.*, II., p. 105.

world and is in turn employed by each of us. Shortly, en, the creative reason is the faculty which constantly erprets and, as it were, keeps up an intelligible world r experience to operate upon, while the receptive reason the intellect applying itself in all the various processes hich fill our minds with the materials of knowledge."[1]

The foregoing account of Aristotle's theory of reason, interpreted by his most notable commentators, exhibits ery wide differences of opinion. This great diversity is ue to the character of the data furnished by Aristotle —data that are both meagre and ambiguous, precluding he possibility of any apodictic formulation of his doctrine. There has been no lack of ability or ingenuity expended n it. It is entirely hopeless, in my opinion, to try to iscover any satisfactory explanation of the creative reason n the scanty passages of the third book of the *De anima*, o which attention has been too exclusively directed. An xplanation, if it can be found at all, can be found only in he light of Aristotle's general system of philosophy, and more especially in the light of his complete theory of knowledge. I shall proceed at once to make my meaning plain.

It is clear that the theory of a twofold reason, as Aristotle held it, originated partly in the controversy regarding the distinction between *conceptual* and *perceptual* knowledge, and partly in Aristotle's metaphysical ideas regarding the distinction between *form* and *matter*. The controversy touching conceptual and perceptual knowledge had before Aristotle's time issued, on the one hand, in the extreme sensualism of the Sophists, and, on the other hand, in the extreme rationalism of Plato. Between these two Aristotle adopts a mediating position of empiricism. To him there are no innate ideas, and no body of rational truth totally independent of particular reality. All knowledge is perceptually derived, but the materials of perception cannot be converted into the fabric of scientific knowledge or into general concepts without a creative and supplementary act of reason. For Aristotle, as for Kant, conception without perception is empty. The content of perception is made into conceptual knowledge by a process of reason, and in this sense is a created content. Before this act takes place, the content of mind is passive matter awaiting a transforming and constructive process. At this point, Aristotle applies to psychical life the metaphysical dualism under which he views the entire organic world. Active reason stands to passive reason in the relation of form to matter.[1] His metaphysics, then, and the distinction between conceptual and perceptual knowledge, explain the genesis of his theory of a twofold reason. The creative reason is the form-principle; the pathic reason is the sum of matter that is formed into rational significance. Reason receives its content from without; in other words, it is passive. However, if that were all, reason would be only a receptacle of sensations, perceptions, memory-images, and phantasmata. But transcending these pathic elements, reason has the informing power of changing their potentiality into the highest abstractions and most general notions and laws. In this way, reason, in its pathic aspect, becomes or receives all reality; while in its active character, it creates all ty by bestowing upon it a rational form. Without the r the mind would be a mass of particulars, of unrelated ifold things, blind. The active reason creates an ligible world in the sense of constructing its intelligi-y, while its real content is given in the materials of the ive reason which are delivered from without. This ent is potentially conceptual. The creative reason is primarily without content, an unwritten tablet.[1] ween conceptual and perceptual knowledge, between abstract and concrete, there is not for Aristotle the at impassable gulf that we find in Plato's epistemology. hough the discovery of the universal is an act of reason, the universal is potentially and immanently in the lividual. The subject-matter of reason is the immanent iversal, which in a certain sense is in the mind itself.[2] ought and sense-perception are neither identical nor are y to be completely sundered. Aristotle sharply criticises th of these extremes in his predecessors, holding the phistic sensualism and Platonic rationalism to be equally e-sided and erroneous. In thought we think, it is true, at is potentially given in perception, and yet this object thought must first be made rational by a creative act of ason. Reason creates its world in terms of itself (*i.e.* a ional world); and, as its subject-matter consists of stract ideas, it thinks itself, and subject and object are entical.[3] Aristotle is not a pure empiricist, although in rtain passages he speaks as if all our ideas were derived om sense-perceptions[4] and apart from sense-perception

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[1] Wallace, *Aristotle's Psychology*, p. xcviii.

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[1] *De an.* 430a 10 ff.

De an. 430*a* 1.

[2] *De an.* 417*b* 23.

De an. 429*a* 25, 430*a* 2, 431*b* 17.

[4] *De an.* 432*a* 2 ff.

there were no reality. In the *Analytics*, however, w
he gives the most detailed account of the origin of
knowledge, he speaks of the highest principles of knowl
as immediate (τὰ ἄμεσα) and as presupposed by media
derived knowledge, being the latter's starting-po
These ultimate principles are propositions whose predic
are given in the subject, *i.e.* 'analytical *a priori* ju
ments.'[2] This knowledge is, however, merely pote
(empty conception) until applied to the content of ex
ence. It does not contain any positive ideas, but, a
the case of the principles of contradiction and exclu
middle, it comes to consciousness in the regulation
determination of cognitive data. These regulative, axiom
principles are formed by the mind out of itself.[3]
content of the concepts arrived at by induction, or by
ascent from particular to general, takes the form of med
knowledge; and the most universal of these concept
only a "precipitate of a progressively refined experie
and is due to the last act in successive generalizations u
a matter given in experience."[4] Ideas derived from
duction attain a degree of certainty not higher than
source from which they spring. On the other hand,
ultimate principles (ἀρχαί) of reason are necessarily tr
and such knowledge has the nature of an "intuition
contrasted with sensible perception."[6] The apodi
syllogism, or highest form of scientific truth, proceeds f

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[1] Cf. Zeller's *Aristotle*, Eng. tr., Vol. I, p. 197. Also Aristotle,
post. 86*b* 36, 94*a* 9, 108*b* 8; *Eth. nic.* 1141*a*.

[2] Zeller, *op. cit.*, Vol. I, p. 198.

[3] *De an.* 429*b* 28 ff.

[4] Zeller, *op. cit.*, Vol. I, p. 201.

[5] Aristotle, *Anal. post.* 100

[6] Zeller, *op. cit.*, Vol. I, p. 202.

ese ultimate principles as premisses. Induction, proceedg from the particular, is clearer to us because individual ings of sense have more apparent certainty. Deduction nd induction form the component elements of scientific ethod, but the function of the former is higher, being he interpretation of phenomena by the ultimate principles oth of knowledge and existence, viz., by universal laws nd causes.

Ultimate principles and universal forms are immanent oth in the mind and in things. They are not mental ategories projected upon the phenomenal world, but are iscovered in the phenomenal world by reason. In a sense, eason finds itself in the world, and the fact of this imnanent community bridges the gulf between subject and bject. On the plane of perceptual knowledge, the passage etween subject and object is bridged by the function of he central sense, which is the active principle in converting received sensations into a conscious percept. The content of the central sense—memory and phantasy—as the pathic material of reason, is in turn converted into the form of conceptual knowledge by the creative activity of reason. Reason has no bodily organ, and so operates only on psychical elements, and not on elements physiologically mediated. Reason, then, confers on a potentially rational world its actually rational existence; and, moreover, in thinking the actually rational, it thinks itself. Without the active reason the conceptual world would be no more known in thought than the visible world would be seen without light.[1] As light makes colour visible, so the creative reason makes the the universal forms intelligible. Or, to use another analogy employed by Aristotle, the creative reason operates on the content of perceptual consciousness as an artist operates on his raw materials.[1] The two main stages in the process of knowledge, perception and conception, are supplementary. Thought, on the one hand, requires a sensuous image,[2] and perception, on the other, remains on a brute level when not illuminated and elevated into conceptual form by reason.

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[1] *De an.* 430a 15.

The creative reason is akin to the divine. Corresponding with his metaphysical conception of the divine in the universe, Aristotle regards the creative reason as the divine in the microcosm. It is no part of the entelechy of the body, but is transcendent (*χωριστός*, *i.e.* it has no bodily organ and is separable from organic life) and it enters the body from without (*θύραθεν*).[3] It acts, however, on the rational life of the organism, but it acts as the 'unmoved mover,' who is immanent in the world without being a part of it. The creative reason is not developed with the body, but enters the psychical element (whose immediate corporeal embodiment is the warm air or *pneuma* in the seed) at the moment of conception. Conception is the occasion, not the cause, of its entering into the womb.[4] The question, however, touching the preëxistence and immortality of the soul is scarcely more than mentioned by Aristotle, and, indeed, it hardly falls within the scope of his psychology, which is an essentially biological discussion. It is only in treating of the nature of reason that he goes beyond the boundaries of empiricism and makes concession to the traditional view of the divine origin of the noëtic power—a concession that may have been prompted by his analogous view of the Prime Mover as the transcendent cosmic reason. Aristotle constructs his psychology, as he does his entire system of philosophy, on the basis of the deliverances of the special sciences of his day—deliverances which were penetrated and interpreted by his unifying and organizing spirit. As Romanes says, "instead of giving his fancy free rein 'upon the high *a priori* road,' he patiently plods the way of detailed research."[1] Yet, after he has completely examined the data and psychical mechanism of empirical knowledge, he finds them inadequate to explain the whole of reality, and is forced to introduce a rational ego to explain the potential rationality of pathic experience. This noëtic principle which rationalizes experience is in no wise connected with the physical organism, and as it is not a part of the latter's entelechy, so it does not perish with its dissolution.[2] It is the *a priori* condition of all rational knowledge, and, as such, it is not individual. Receptive or pathic reason,[3] on the other hand, is simply the life of sensation as a potentially rational ma connected with the physical organism, with perishes.[1] Primarily, the creative reason is, as abo without content; it is an unwritten tablet (γραμ Its content is given in the passive reason, which with phantasmata ultimately derived from sense free construction of imagination. Strictly spea active reason does not think things, it does not *novo;* it merely interprets things, or rationaliz mena, by its spontaneous activity.[3] Nevertheless, here not merely that which is given in sense-e but a new element, rationally derived, a new sig Passive reason rises no higher than the delive sense-perception and their re-wrought form in me phantasy. The sum of these is the sum of the c the *sensus communis;* this sum, regarded as pote the passive reason, on which the active reason o the creation of a rational and conceptual wor creative reason does not, indeed, think anythi from the passive reason,[4] because without image from experience thought has no content and n interpret or illumine. Its activity, however, is co because its subject-matter, unlike a sense-object, i present. Further, as the universal reason, it is a and continuous as is the intelligibility of the etern

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[1] *De an.* 430*a* 12.

[2] *De an.* 431*a* 17, 432*a* 8; *De mem.* 449*b* 30.

[3] *De gener. anim.* 736*b* 27 ff.

[4] *De gener. anim.* 737*a* 5 ff. Granger in a valuable article in *Mind* (Vol. 18, New Series, Vol. 2, 1893, p. 317) thinks that a universal reason in Aristotle's psychology can be spoken of only in the sense in which one speaks of "a universal humanity." Cf. the same writer in the *Classical Review*, Vol. VI., pp. 298 ff.

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[1] *Contemporary Review*, Vol. 59, p. 284. [2] *De an.* 408*b* 18, 413*b* 20 ff.

[3] No one familiar with Aristotle's use of terms, will discover an objection in his applying two designations to the same thing, *viz.* to his calling the sum of perceptual experience now *sensus communis*, and again passive reason. For as completed sense-experience, the *sensus communis* is form (εἶδος), and as the raw material for some higher development it is potentiality (ὕλη). That higher development is reason, which the common sense *is* potentially.

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[1] *De an.* 430*a* 25.

[2] *De an.* 430*a* 1.

[3] Cf. Scotus: "nullus intellectus intelligit, nisi intellectus pos [intellectus agens] non intelligit, sed intelligere facit." Quoted mann in *Das Vergängliche und Unvergängliche in d. mensc nach Arist.* p. 48.

[4] *De an.* 430*a* 25.

[5] *De an.* 430*a* 22.

[6] *De cœlo,*

We do not remember[1] the processes of the active reason—an understanding of which in the individual is arrived at only by analysis — because it is without passivity, and memory is a passive power.

Aristotle describes the creative reason (I draw from various passages) as follows: it is unmixed, transcendent, passionless, of divine nature, it suffers no change, is not born, it has no bodily organ, enters the body from without, and is immortal.[2] The question of the reason's transcendence and immortality, although metaphysically interesting, has little epistemological significance, and Aristotle scarcely does more than raise the question, and while he espouses the view of transcendence and immortality, he does so hesitatingly and without dogmatism. Transcendence, indeed, would seem to have no legitimate place in his biological view of the soul and to be irreconcilable with his definition of ψυχή as "entelechy of the body." It is a survival of the Platonic transcendentalism, with which Aristotle had been imbued during his life in the Academy, and whose spell he never quite shook off,—a thing to be set down to his credit.

In the foregoing account of Aristotle's theory of reason I have endeavoured to show how his employment of the terms 'form' and 'matter' and his criticism of the Socratic-Sophistic controversy regarding conceptual and perceptual knowledge can be made to supplement certain dark passages in the *De anima* and the *Analytics*, and how these various elements can be combined into an intelligible and consistent interpretation. Briefly summarized, this interpretation is as follows: Aristotle adopted a mediating position between the ultra-sensualism of the Sophists and the ultra-rationalism of Plato. The totality of knowledge is neither purely empirical nor purely rational, but a composite (σύνολον, as is every other combination of 'form' and 'matter') of sense experience and rational activity. In this composite, rational activity is related to sense-experience as εἶδος is related to ὕλη. The sum of sense-data constitutes the potentiality of reason, *i.e.* it constitutes the passive reason, while their construction into actual rational significance constitutes the activity of creative reason; the real content is given in the former, the formal content in the latter. The content, therefore, of the *sensus communis* regarded as rational potentiality is the νοῦς παθητικός; the power which converts this potentiality into actual rational forms or meanings is the νοῦς ποιητικός. This conversion is identical with the erection of perceptual materials into a world of concepts and laws. The subject-matter of reason is an immanent universal,—immanent at once in perceptual reality and in the reason itself. The process which the reason undergoes in discovering the universal is, therefore, the process of finding itself in the world. The conception of an equivalence between the universal forms existing in the mind and universal forms immanent in nature bridged for Aristotle the gulf between subject and object,—two aspects of reality which he regarded as formally identical.

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[1] *De an.* 430*a* 23.

[2] *De an.* 408*b* 18-29, 413*b* 24, 430*a* 12 ff.; *Eth. nic.* 1177*a* 15; *De gen. anim.* 736*b* 15 ff.

ABBREVIATIONS.

[ ] = words regarded by Biehl as not belonging to the text and to be deleted.

([ ]) = words inserted by the translator.

The marginal references, *e.g.* 402*a*, are to the pagination (with column *a* or *b*) of the Berlin (quarto) edition. The other marginal references, *e.g.* 2, 3, 4, are to the sections in the chapters of the Oxford (octavo) edition.

ARISTOTLE'S PSYCHOLOGY.

(DE ANIMA.)

BOOK THE FIRST.[1]

CHAPTER I.

We regard knowledge as a good and precious thing, but 402 a
we esteem one sort of knowledge more highly than

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[1] Bonitz regards the various chapters of *De an.* Bk. I. as Aristotle's, although he thinks that the order in which they are placed is due to another hand (*Monatsbericht der Königl. Preuss. Akad. d. Wiss.*, 1873, p. 481). The authenticity of Bks. I. and II. has never been seriously questioned. Bk. III., however, was held by Weisse to be spurious (*Aristoteles von der Seele*, pp. 278 ff.), but no scholar now, to my knowledge, accepts his view. The Aristotelian canon is much less questionable than the Platonic, and, as far as the acroamatic writings are concerned, has always remained comparatively fixed. The objection of Bonitz to Bk. I. scarcely means more than that its Aristotelian content was subjected to editorial arrangement, which was not always skilful,—a criticism that may be applied to every other treatise in the *Opera*. To attempt to determine how much latitude Andronicus and the succeeding editors allowed themselves, is merely to speculate. All of the works, without exception, are fragmentary and ill put together, but this has been explained generally by the time-honoured hypothesis (and still the most reasonable one) that the writings of Aristotle, as we have them, are lecture-notes or perhaps sketches for treatises, which he never put into finished form, the last part of his life being disturbed by quasi-religious persecution and spent practically in exile.

another either because of the acumen[1] required for its discovery, or because it is concerned with better and more admirable objects: for both these reasons we should rightly assign the investigation of the soul[2] to the first rank. Further, it is supposed that a knowledge of the soul has an important bearing on all truth, and particularly on that of the natural world. For the soul is,
2 as it were, the genetic principle[3] in living things. Our

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[1] This meaning of κατ' ἀκρίβειαν appears to be the only one admissible in the context. Cf. Passow, *sub voc.* The meaning which the term has when applied to metaphysical or abstract subjects (*Eth. nic.* 1141*a* 16; *Metaph.* 982*a* 25, 1078*a* 10; *Anal. post.* 86*a* 17), viz., 'exactitude' in the sense of 'finally true' or truth deduced from the first principles of reality, is not applicable here. Aristotle regards the materials of psychology as belonging to the natural and organic world, which to him is never the realm of necessary or exact truth. 'Ακρίβεια in the ordinary sense of 'precision' is ascribed to the mathematical disciplines in varying degrees (*Met.* 1053*a* 1, 995*a* 15; *Anal. post.* 87*a* 35), but this sense is also inadmissible here (cf. 402*a* 11). In addition to those meanings which refer to the science itself, the word also has a signification which refers to the demand made by the science on the investigator, viz., 'painstaking accuracy,' or 'acumen' ('Scharfsinn,' Passow). In the present passage this appears to be the only usable meaning. *Vid.* Wallace, *Aristotle's Psychology*, p. 196; Trendelenburg, *Arist. De an.* 2nd ed. p. 156.

[2] ψυχή ('soul,' 'life,' 'mind,') is generally translated in the following pages by 'soul.' For a discussion of its meanings in Aristotle's writings *vid.* Introduction, Chap. i.

[3] 'Αρχή (*principium*) is included amongst the notions defined by Aristotle in his philosophical dictionary (*Metaph.* Bk. V.). Through him it became a philosophical term of the first importance, and has continued so to the present time. In the sense of element (στοιχεῖον) we find it in use as early as Anaximander. The meanings enumerated in the *Metaphysics* are: In reference to (1) space and time = beginning; (2) method = elementary steps in learning; (3) the physical = basis; (4) the genetic = the moving cause; (5) the political = primary authority; (6) knowledge = *principium cognoscendi*, as *e.g.* the premises of a syllogism. The scholastics included these several meanings under *principium essendi* and *principium cognoscendi*, for which Aristotle has the corresponding expression, τοῦ γνῶναι καὶ τῆς κινήσεως ἀρχή (*Met.* 1013a 22).

aim is to investigate and ascertain the essential nature of the soul, and, secondly, to discover those properties which attach to it as accidents. Certain of the latter are supposed to be conditions peculiar to the soul's own nature, and others are thought to be effects produced in living beings by the soul's agency.

Now, it is altogether the most difficult problem 3
to arrive at any fixed belief touching the soul. From
the fact that the problem is one which is common
to other subjects—I mean the problem of finding the
essence and real definition[1] of a thing—it might perhaps
appear to some that there is a single scientific method
which applies to everything whose essence we wish to
discover, as deductive proof applies to accidental pro-
perties. We shall, therefore, be obliged to make inquiry
into this question of scientific method. But if there is 4
no single and general method which applies to the
ultimate nature of things, our investigation becomes in
that case all the more difficult. And even if the
question of method were cleared up, whether its form
be that of deductive proof, or analysis, or some other
procedure, there still remains a question of great diffi-
culty and uncertainty, viz. from what principles are
we to start our inquiry? For different principles are
employed in different subjects, as *e.g.* in numbers[2] and
in plane surfaces.

The first necessity, perhaps, is to determine under 5

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[1] For the meaning of τὸ τί ἐστι see Schwegler's classic excursus in his *Die Metaphysik des Aristoteles*, Bk. IV., pp. 369 ff. Also Trendelenburg in *Rheinisches Museum*, 1828, pp. 457 ff.

[2] The different principles employed by arithmetic and geometry are the unit and extension.

what genus soul is to be classified and what its nature is
—I mean by this the question whether it is an individual
thing and self-subsisting entity, or whether it is a quality
or a quantity or classifiable in one of the other cate-
gories[1] already enumerated, and further, whether it is a
potentiality[2] or rather an actuality. For this makes no
402 b slight difference. We must also inquire whether the
6 soul is divisible or whether it is without parts; whether
it is an entirety of one sort or not. And if it is not of
one sort, we must further ask whether the differences are
specific or generic. For nowadays the men[3] who discuss
and investigate the soul appear to direct their inquiries
7 merely to the human soul. We must take pains to see
whether there is a single definition that applies to the
soul, just as *e.g.* there is a single definition that applies to
animal, or whether a different definition is required for
each kind of soul, just as a different definition is required
for horse, dog, man, god, and we must further inquire
whether the common notion 'animal'[4] either is nothing

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[1] The categories or forms under which Being is known, are enumerated in the *Topica* (103*b* 22) as follows: 1. Substance, 2. Quantity, 3. Quality, 4. Relation, 5. Place, 6. Time, 7. Position, 8. Possession, 9. Activity, 10. Passivity. All of them are reducible to subject (ὄνομα, corresponding to the category of 'substance') and predicate (ῥῆμα, corresponding to the nine remaining categories).

[2] For an explanation of the terms potentiality and actuality *vid.* note 1, p. 42.

[3] It is not known to whom reference is made here. Simplicius (*Comment. in lib. De an. ad loc.*) thinks the *Timaeus* is referred to, which is hardly possible owing to Plato's treatment of the world-soul. Nor is it easy to see how Wallace (translating *νῦν μὲν* by "at present" as he does), can suppose the reference is to the older physiologers.

[4] The question as to the nature of universals, which divided the Mediaeval Nominalists and Realists, was here clearly raised by Aristotle. *Vid.* Simplicius, Commentary *ad loc.*

at all or else comes into existence only after the individual,—a question that might equally well be raised regarding any other general notion. If, however, there are not several souls, but only parts of a single soul, then the further question arises whether we should examine the soul as a whole before we examine the parts. It 8 is also hard to determine which of these parts is in its nature different from the other and whether we should first investigate the part or the part's function, *e.g.* whether we should first investigate the process of thought or the faculty of thought, sense-perception or the organ of sense-perception; the same question applies to other cases. Now, supposing that the functions take precedence of the faculties in the order of investigation, a further question might arise here as to whether the complements of the faculties should be investigated before the faculties themselves, *e.g.* whether the investigation of the sensible object should precede the investigation of the sense-organ, and the object of thought precede the faculty of thought. Not only does the knowledge of the 9 essential nature of a thing seem to be helpful towards the understanding of the accidental nature and properties of substances, just as in mathematics the knowledge of the essential nature of straight or curved or of a line or surface is helpful in understanding how many right angles are contained in the angles of a triangle, but conversely, the knowledge of accidental properties contributes largely to the understanding of what a thing essentially is. For when we are able to give an account of the accidental properties of things, as we see them,—either of all these properties or of most of them,

—then we are best able to speak also of their essential nature. For the essential nature is the true starting-point in all deductive proof. And so in the case of definitions where not only no knowledge of the accidental properties is furnished, but where it is not easy even to 403*a* conjecture what these properties are, it is evident that all such definitions are framed after the fashion of dialectics[1] and are void.

10 A further difficulty presents itself regarding the affections of the soul, viz. whether all these affections are common to the soul and to the body which contains it, or whether there is a something that is the exclusive property of the soul. And it is necessary, though not 11 easy, to solve this difficulty. In most cases the soul apparently neither acts nor is acted upon independently of the body, *e.g.* in the feelings of anger, courage, desire, or in a word in sense-perception. Thought, however, appears to be a function which more than any other is the exclusive property of the soul. But if thought is a sort of representation in terms of a sense-image, or is impossible without this, then even thought could not 12 exist independently of the body. If, then, there were any function or affection of the soul that were peculiar to it, it would be possible for the soul to exist separate and apart from the body.[2] If, however, there is nothing

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[1] *I.e.* distinctions thus made are merely verbal or eristic and have no real content.

[2] The difficult question as to whether the soul is capable of existing separately from the body is not very clearly or definitely answered by Aristotle. According to Aristotle's classic definition, the soul is the "entelechy of a body endowed with the capacity of life." From this definition one would conclude that the soul cannot exist apart from

which is its exclusive property, it cannot exist apart, but the case is similar to that of a straight line, which, as straight, has many properties, *e.g.* contact with a bronze globe at a given point, although the quality 'straight,' apart from some body, does not touch the globe. For it has no abstract existence, as it is always conjoined with some body. The same thing seems to hold good 13
of the properties of the soul: courage, gentleness, fear, pity, audacity, also joy; love, hate; they are all associated with the body. For along with these psychical conditions the body is also somewhat affected. A proof 14
of this is the fact that sometimes when great and palpable misfortunes have befallen a man, he is not at all excited or moved to fear; on the other hand, one is sometimes aroused by slight and insignificant mishaps, and then the body swells in rage and is in the same condition as when a man is stirred in anger. But this statement receives still more support from the fact that when nothing has happened which could awaken fear, men exhibit those emotions which characterize a man in fright. And if this is true, it is evident that the 15

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the body, although it is not itself corporeal. It is that which gives to a particular body its individuality and meaning, and it consists of the following elements: power of nutrition, self-movement, sensation, memory, emotion, imagination, and reason. Amongst these functions of the soul, reason is peculiar to man, although reason in its passive form is based on sensible experience and is conjoined with the life of the body. There is, however, a further form of reason, which Aristotle characterizes as active reason (νοῦς ποιητικός), whose existence is entirely separable from the body, and is immortal (*De an.* 403*a* 23). This form of reason is concerned with intuition or immediately apprehended truth, while the passive reason is occupied with mediated truth. There seems, however, to be no place for the former in Aristotle's definition of the soul cited above. Cf. Introduction, *On the Active and Passive Reason.*

emotions are ideas which find expression in the body.
So that we have, for example, such definitions as the
following: "Anger is a kind of movement of such and
such a body, or part, or faculty, under this or that
stimulus and due to this or that motive." It is for
this reason that the study of the soul belongs to the
province of the natural philosopher, either the soul in its
entirety or such part of it as has to do with the body.
16 But the naturalist and the speculative philosopher would
frame their definitions severally from different stand-
points. For example, in reply to the question "What
is anger?" the speculative philosopher says it is the
desire of retaliation or something of that sort, the
naturalist says it is the seething of the pericordial blood
403 *b* or heat; the one has furnished in his answer the matter,
17 the other the form or reason, of the thing. For the
notion is the form of a thing, and it is necessary that
this notion be embodied in a particular matter, if it is
to exist. For instance, the notion of a house is that
of a shelter, to protect us against injury from wind and
rain and heat; the natural philosopher, however, will
call it stones and bricks and wood, while the other
grasps the notion embodied in these things and for which
18 they exist. Which of these, now, is the real physical
philosopher? Is it the one who busies himself with
the matter, but is ignorant of the notion? or is it the
inquirer who is occupied with the notion alone? I
answer, it is rather the man who combines both of
these characters. But what is the genius of each of
these two men? Surely there is nobody who concerns
himself merely with the properties of matter that are

inseparable and merely as inseparable; but the physical
philosopher has to do with all the functions and qualities
of body and matter which are of such and such a kind.
Such properties as are not subject-matter for the natural
philosopher, are dealt with by someone else, in certain
instances by a professor of one of the arts, perhaps, as
e.g. by a builder or by a physician. But in the case
of properties which are inseparable, although they attach
to no particular body and may be abstractly regarded,
with these the mathematician is concerned; and in 19
so far as the qualities are regarded as abstract or
transcendent entities, the metaphysician is concerned
with them. But we must now return to the point from
which our discussion digressed. ✓We were saying that
the properties of the soul do not exist apart from the
physical matter of living things, in which such qualities
as courage and fear are expressed, and are not to be
regarded as a line or surface.

CHAPTER II.

In our inquiry into the soul it is necessary for us, as we
proceed, to raise such questions as demand answers; we
must collect the opinions of those predecessors[1] who
have had anything to say touching the soul's nature, in
order that we may accept their true statements and be
2 on our guard against their errors. The initial step in our
inquiry will be to set forth those attributes which are
currently supposed to inhere in the soul's nature. Animate
nature is thought to be different from the inanimate
mainly in two particulars, viz. in movement and sense-perception.
And these, I may say, are the two
traditional characteristics of the soul which we have
received from earlier writers. Some of these writers,
indeed, affirm that motion is the first and foremost
characteristic of the soul; and in the belief that what is
itself unmoved cannot impart motion to anything else,
3 they suppose that the soul is a moving entity. This
404 a is the reason why Democritus declares the soul to be a
sort of fire or warm element. He asserts that, although

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[1] Aristotle begins here the first extant history of psychological opinion.

atomic structures are infinite in variety, both fire and soul are composed of spherical atoms, similar to the particles, as we call them, seen in the air when sunbeams stream through a doorway, and these atoms, as collective seed-particles, he calls the elements of the universe. Leucippus also holds a similar view. It is the 4
spherical atoms, he says, that constitute the soul, because such forms can most easily penetrate through everything, and, being themselves in motion, can move everything else, the theory of these philosophers being that the soul is the principle which imparts motion to animals. It is 5
for this reason too that they regard respiration as the function that fixes life's limit. They think that the surrounding air presses together and expels the atomic bodies, which, because they are themselves never at rest, impart motion to animals, but that relief comes through respiration, because similar particles thereby enter into the body from without. These latter, by restraining the contracting and condensing element, prevent the spherical atoms which are already in animals from being entirely expelled. So long as they can do this, life continues.
The theory which has been handed down from the 6
Pythagoreans appears to have the same import. For some members of this school maintain that the sun-motes in the air are the soul; others declare that the soul is the principle which sets these in motion. They refer to these particles in their theory, because the particles appear to be in constant motion, even when there is a complete calm. The philosophers who regard the soul as a self-moved principle come to the same conclusion.
For they all seem to regard motion as the most char- 7

acteristic attribute of the soul, and while everything else is moved by the soul, the soul is self-moved. They came to this conclusion because they observed that nothing sets anything else in motion without being itself in
8 motion. In a similar spirit Anaxagoras also declares the soul to be the principle of motion, and this view is held by such others, if there are any, as assert that Reason sets the All in motion.[1]

Anaxagoras does not, however, quite agree with Democritus. For Democritus absolutely identifies soul with reason, and considers truth to be that which appears to the senses. Consequently, Homer is right in singing of Hector that he lay "thinking awry."[2] Democritus does not employ reason as a specific faculty for the apprehension of truth, but asserts that soul and reason are identical. Anaxagoras, however, is less clear on this point. For although he says in many passages 404 b that reason is the cause of the beautiful and the true, in other passages he says that reason is the same as the soul, for it is found in all animals, great and small, high and low. Reason, however, in the sense of intelligence, is not found equally in all animals, nor even in all men.

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[1] The pre-Aristotelian definitions of the soul here cited are classifiable into three main groups: (1) those that regard the kinetic or motive attributes of the soul as its fundamental characteristic; (2) those that regard the intellectual and cognitive attributes as fundamental; (3) those that attempt to combine these two elements of activity and knowledge.

[2] No such reference as this is to be found in our present text of Homer, although the term ἀλλοφρονέοντα occurs in *Il.* xxiii. 698. Cf. also Ar. *Metaph.* iv. (iii.) 5. 1009*b* 28. The word is here employed in the meaning of 'to think incorrectly,' while φρονεῖν signifies, when contrasted with ἀλλοφρονεῖν, 'to think correctly.' Hector lies senseless from a blow, and as thought, in the psychology of Democritus, originates in sensation, his thinking cannot be true, but is paralyzed or perverted proportionately to the disturbance in sensation. Error and mental disturbance (ἀλλοφρονεῖν) are explained by disturbance in the activity of the senses (cf. Siebeck, *Geschichte der Psychologie*, Th. I. Abth. i. p. 129; Natorp, *Forschungen zur Geschichte des Erkenntnissproblemes im Alterthum*, pp. 171 ff.). Democritus makes a distinction, however, between the relative values of rational and perceptual knowledge, between λόγος and αἴσθησις, although both originate in external stimuli. The ultimate, and in this sense the real, nature of things is not discoverable by the senses, but only by rational thought. The true nature of the world consists of atoms and the void, and these are known not to our senses, but to our reasoning mind; they are νοητά. The data, however, for these rational truths are to be sought in the deliverances of the senses.

10 Such philosophers as fix their attention on movement as the main fact in animate creation conceive of the soul as the most mobile principle. On the other hand, such philosophers as emphasize the knowledge and perception of reality, define the soul as the principle of things, some holding there are several such principles, others that this psychical principle is the only one. Empedocles, for instance, regards the soul as composed of all the elements, and he asserts that each of these elements is a soul. He says:

> "Earth we apprehend by earth, water by water,
> And air divine by air, destructive fire by fire,
> And love we know by love, sad hate by hate."

11 In this way, too, Plato in his *Timaeus*[1] constructs the soul out of the elements; for we know like by like, and things are composed of elemental principles. A similar theory is given in his *Discourses on Philosophy*,[2]

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[1] *Timaeus*, 30 C, 35 A, 39 E.

[2] No such work of Plato is known to us, and the reference is probably to the oral discourses held by Plato in the Academy. *Vid.* Bernays, *Die Dialoge des Aristoteles*, p. 170; Heitz, *Die verlorenen Schriften des Aristoteles*, p. 180; Zeller, *Phil. d. Griechen*, Th. II. Abth. ii. 3te. Aufl. p. 64, note.

where he defines an animal, regarded absolute as a structure derived from the idea of unity and t primary elements length, breadth, and thickness; ot
20 things are similarly fashioned. Again, in a differe way. Plato defines reason as unity, and science as tw for the latter moves towards unity in a single course.] also defines opinion as the number of a plane surface a sense-perception as the number of a solid. Numb were declared to be the actual forms and first princip of things and to be composed of the elements. E things are discerned partly by reason, partly by scien partly by opinion, and partly by sense-percepti
25 Numbers, however, are the forms of things. Sir the soul was regarded by these Platonists as at or the principle of motion and the principle of knowled some of them included both these ideas in th definition, and explained the soul as a self-movi number.[1] These philosophers differ, however, in rega to the kind and number of their principles. The m far-reaching difference is that between the philosoph who regard the elements as corporeal and those w regard them as incorporeal. There are others who defi
405 a the elements as a composite of corporeal and incorpore
14 They differ also in regard to the number of the elemen some believing there is one only, and others that there a several, and their definitions of the soul vary with th theories of the elements. Amongst the primal eleme they classified, not unreasonably, the principle of inhere

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[1] Xenocrates of Chalcedon (396-314 B.C.), successor of Speusip as Scholarch of the Academy. *Vid.* Ueberweg-Heinze, *Grundriss Geschichte d. Philosophie*, Th. I. p. 191, 8th ed.

movement. And so some philosophers held the soul to be fire; for fire is the finest and most nearly incorporeal of all the elements, and furthermore, it most readily receives and imparts motion. Democritus has explained 15 in a very neat way the cause of these phenomena. Soul and reason, he says, are identical, and belong to the primary and indivisible bodies, and are, furthermore, the principle of motion by virtue of their particles and atomic forms. Amongst these atomic forms, he regards the spherical as the most easily moved, and says that reason and fire are of this sort. Anaxagoras, on the 16 other hand, appears to say that the soul and reason are different, as we remarked above, and yet he employs them as essentially one, except that he regards reason as more than anything else the initial principle of the world. At any rate he asserts that reason is the only entity which is absolute, unmixed, and pure. But he 17 ascribes both attributes of knowledge and motion to the same principle, affirming that reason sets the universe in motion. Thales also, according to the traditional stories of him, appears to have conceived of the soul as a sort of kinetic principle, if it be true that he said the loadstone 18 has a soul because it moves iron. Diogenes, however, and certain others say that the soul is air, in the belief that it is the finest element and the ultimate principle. It is for this reason, also, that the soul knows and produces motion. On the one hand, it knows by virtue of the fact that it is primary and other things are derivatives from it. On the other hand, it is the principle of motion by virtue of its being the first element. Heraclitus, also, says the soul is the first 19

principle, since it is fiery vapor from which everything else is derived. It is also the most incorporeal of all the elements and is in constant flux. We apprehend that which is moved by what is in motion, and he believed, as did most others, that the real world is in
20 motion. Alcmaeon,[1] too, appears to have held views of the soul very similar to these. For he says the soul is immortal because it is like the Immortals, and this property of immortality belongs to it by virtue of its perpetual motion. Now, all divine things are in
405 *b* perpetual motion,—moon, sun, stars, and all the heavens.
21 Certain cruder thinkers, like Hippo, asserted that the soul is water. They appear to have based their belief on the nature of animal seed, which in all cases is moist. Hippo confutes those who say the soul is blood by the argument that the seed is not blood, and seed is the
22 elemental soul. Others, like Critias,[2] regard the blood as the soul, on the supposition that the most characteristic attribute of the soul is sense-perception, and sense-perception is due to the blood. So all the elements, with the exception of earth, have received a vote. No one has represented earth as the principle of soul, unless it were certain philosophers who regarded the soul as composed of all the elements, or as identical
23 with them all. They all define the soul, one may say, in terms of three things: motion, sensation, and incor-

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[1] Alcmaeon, physician of Crotona, who is usually classified amongst the Pythagoreans, regarded self-movement as the essential characteristic of the soul. By means of this power of self-movement he appears to have explained the continuity of organic life, in addition to finding in it an argument for immortality. *Vid.* Siebeck, *Geschichte d. Psychol.* Th. I. Abth. i. p. 91.

[2] Critias, the leader of the Thirty Tyrants and uncle of Plato.

poreality, and each of these is referred back to the
ultimate elements. Therefore, with one exception,[1] those
who define the soul in terms of knowledge, make it an
element or a derivative of the elements. For they say
that we know like by like, and inasmuch as it is the
soul that knows all things, it must consist of all the 24
elements. Those philosophers[2] who maintain there is
only one cause and one element, regard the soul as a
unit, like fire or air. On the other hand, the philosophers
who maintain that there are several elements,
make the soul a plurality. Anaxagoras alone declares
that the soul is affected by nothing and has nothing in
common with anything else. But, if this is its nature, 25
he did not explain, nor is it evident from his writings,
how the soul is to acquire knowledge and virtue. The
philosophers who include contraries amongst their first
principles[3] regard the soul as composed of contraries.
On the other hand, those who include in their principles
only particular contraries,[4] such as heat and cold or
similar opposites, likewise regard the soul as one of these.
And so there are some who take into consideration the 26
derivation of the words, certain of them claiming that
the soul is heat because the verb 'to live' is derived from
this,[5] others claiming the soul is cold, because the name
'soul' is derived from respiration and refrigeration. These,
then, are the traditional views of the soul, and these
are the grounds on which they have been advanced.

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[1] Anaxagoras.

[2] The Ionian physiologers.

[3] The Pythagoreans, who regarded the soul as a harmony of contraries.

[4] Heraclitus, Empedocles, Hippo, and perhaps the pythagorizing Alcmaeon.

[5] *I.e.* because ζῆν ('to live') is derived from ζεῖν ('to seethe') or ψυχή ('soul') from ψύξις ('refrigeration').

CHAPTER III.

WE must now proceed at once to the investigation o
motion. For the view[1] that the soul is a self-movin
406 a entity, and capable of imparting motion, may not onl
be a false theory of its essence, but it may even be a
impossibility for motion to inhere in it at all. We hav
already said[2] that what imparts motion is not of neces-
2 sity itself in motion. Everything that is moved is moved
in one of two ways: it is moved either by some othe
thing or from a principle within itself. We speak o
objects moved by some other thing when they are moved
by being within a moving body, *e.g.* sailors. But sailors
are not moved in the same sense as that in which a ship
is moved. The one is moved in its own nature; the
others are moved by being within a moving vessel.
3 This is clear when applied to the parts of the body;
walking is a motion that is peculiar to the feet, but
it is also a property of man, though it is not a
property of sailors at the moment in question. Now,

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[1] Criticism of the view of Plato. The paraphrast Themistius cites the *Laws*, Bk. 10, ed. Spengel. p. 26. *Vid. Laws*, 896, and *Phaedr.* 245, 246.

[2] *Phys.* Bk. VII., Ch. iv. and v., 245 *b*-258 *a*.

inasmuch as motion is employed in two senses, let
us investigate the soul, and ask whether it is self-
moved or only participates in movement. Movements
are of four kinds: movement in place, qualitative 4
change, decay, and growth. The soul's movement, then,
must be one, or several, or all of these. If it is not
moved accidentally, its motion must be a natural attri-
bute. If this is true, then space[1] must be an attribute,
for all of the aforesaid movements are spatial. If, then,
the essential nature of the soul is self-movement, its 5
movement will not be accidental, as in the case of the
movement of a white object or of an object three cubits
long. For what moves is body, of which these are only
predicates. Space, therefore, does not belong to them.
But space is an attribute of the soul, if the soul by its 6
own nature participates in motion. Again, if the soul is
moved by virtue of its own nature, it can also be moved
by external force. And if it can be moved by external
force, it can also be moved by virtue of its own nature.
The same conditions hold in regard to rest; for in the
state into which an object is moved by nature, in this

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[1] The arguments against the Platonic doctrines are, briefly summarized, as follows: Motion cannot be the soul's essential nature, (1) because this would require that the soul be spatial; (2) the soul must be moveable by external force; (3) it must be held in rest by external force, and these forced states of motion and rest are inconceivable; (4) the composition of the soul will be determined by the character of its movements; (5) it will experience the movements which it imparts, and as it effects spatial motion, so it will experience spatial motion, and may consequently enter into the body after having passed from it; (6) if movement is the displacement of the object in motion and the soul's essential nature in movement, then motion would imply the soul's displacement out of its essential nature. *Vid.* Wallace's excellent note (Commentary *ad loc.*), parts of which I have used in this connection.

state it also rests by nature. Likewise when an object is moved by external force into a certain state, it also rests in this state by force. It is not easy to give even a conjectural explanation of the character of forced states of motion and rest in the soul.

7 Again, if the soul's movement be upward, its composition will be fire, and if downwards it will be earth, for these are the movements which are characteristic of these elements. The same reasoning holds good of the intermediate elements. Again, since the soul evidently sets the body in motion, it is reasonable that it also experiences those movements which it imparts. If this is true, it is also true conversely that the motion which the body
406 *b* experiences is experienced by the soul. Now, the body
8 is moved in space. The soul should therefore change place as the body does, and either the entire soul, or certain of its parts, should change position. If this is possible, then it would also be possible for the soul to enter again into the body after it had once passed out. From this would follow the impossible conclusion that animals once dead can rise again. In regard to movement in the sense of accident, the soul could be set in movement by some external body, for an animal
9 might *e.g.* be pushed by external force. One must not, however, suppose that a thing which in its essential nature is self-moved, is moved by anything else save in an accidental sense; just as the absolute or final good cannot be the relative or secondary good. If the soul is moved at all, one would say that its
10 motion is caused by the objects of sense more than by anything else. However, if the soul moves itself, it

must itself experience motion, so that on the supposition that every movement is the displacement of the object in motion, in so far as it is moved, the soul must suffer displacement out of its essential nature, provided its self-motion is not merely accidental. But it is to its essential nature that motion belongs. There are 11
also some who, like Democritus, and in a spirit similar to that of the comedian Philippus, say that the soul moves the body[1] (in which the soul resides), just as it moves itself. For Philippus tells us that Daedalus made his wooden statue of Aphrodite capable of movement by pouring quicksilver into it. And Democritus 12
says much the same thing when he tells us that the spherical atoms, which are never at rest, move the whole body by their pull and push. But the question we have to ask is whether these same particles produce rest also. It is difficult or quite impossible to say how they are to do this. In a word, it is not in this way that 13
the soul seems to set the body in motion, but rather by some act of volition or thought.

Similarly the *Timaeus*[2] explains on natural principles the soul's movement of the body: because it is self-moved, it also moves the body with which it is intimately bound up. The *Timaeus* regards the soul as 14
composed of the elements, and as divided into parts corresponding to harmonic numbers, in order that it may have an innate perception of harmony and possess in its entirety harmonic movements. *Timaeus* thus bent the straight line into a circle, which later he divided into two circles joined at two points, and further subdivided

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[1] *I.e.* by mechanical action.

[2] *Timaeus*, 34 A, 36 C.

407 *a* the original circles into seven others, on the supposition
15 that the heavenly orbits correspond to the movements of the soul. Against this view one may say, in the first place, that it is incorrect to speak of the soul as a magnitude; by the soul of the universe he evidently means some such thing as what we call reason. At any rate it cannot, of course, be the sensitive or the appetitive
16 soul, for their motion is not circular.[1] But reason is one and continuous, as is also the process of thought. Now the process of thought consists of thoughts, and these in their succession form a numerical unity, though not a unity in the sense of magnitude. Neither is reason, therefore, continuous in this sense, but it is either indivisible or not continuous in the sense of magnitude. For how, indeed, is it to think, if it is magnitude? Does it think in its entirety or by means of some one of its parts? If it thinks by means of one of its parts, it must be either as a magnitude or as a point, if
17 one can properly speak of a point being a part. Now, if it be as a point and the points are infinite in number, it is evident that it will never reach a conclusion; if, on the other hand, it be as a magnitude, it will think the same thing many times or an infinite number of times. But the fact seems to be that a thing is capable of being thought once for all. If, however, it is enough that the soul should have contact in any of its parts, why need it

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[1] The action of sensation and appetite is direct (*i.e.* they are, as Aristotle conceives them, directly from or to an object) and after the analogy of a straight line. The action of reason, on the other hand, which interprets things in terms of its own forms and laws, and in thinking ideas returns, in a sense, upon itself, is analogous to circular movement. The analogy is further evidenced by the continuity of its processes. Cf. our expression to 'revolve' a thing in thought.

move in a circle or have any magnitude at all? But if thought requires contact in a complete circle, what is the significance of contact in any part? Again, how is the 18 soul to think the divisible by means of the indivisible, or that which has no parts by means of that which has parts? Reason, however, must be a circle of this sort. For thought is the movement of reason just as revolution is the movement of a circle. If, then, thought is a revolving movement, reason must be a circle of which thought is the revolving movement. And, more than 19 this, reason must always think something, if circular motion is perpetual. Now, this cannot be true, for the thoughts which issue in conduct have certain limitations (they are all determined by an end), and speculative thoughts are determined by logical processes. Every logical process is either definition or demonstration. Demonstrations proceed from a premise and have some 20 form of termination in a syllogism or conclusion. And supposing they do not issue in a conclusion, still they do not turn back to the premise or starting-point, but continually take a new middle and extreme term, and so proceed in a straight line, whereas circular motion turns back to the starting-point. All definitions, too, are 21 determinate. Further, if rotation completes itself several times, one will necessarily think the same thought several times. Again, thought seems more like rest and attention than like motion, and the same thing applies to the syllogism. More than this, whatever is difficult or contrary to nature cannot be pleasurable. Now, if motion is not an essential property of the soul, the soul must move 407 *b* contrary to its nature. And it must be painful for it to 22 be united with the body from which it cannot free itself, and such a union is even to be avoided, if it be true that the reason is better off when separated from the body—a view commonly held and concurred in by many persons.

23 The cause, also, of the circular movement of the heavens is not clearly known. Circular movement is certainly not due to the essential nature of the soul, which moves in this way only accidentally, nor is it due to the body, for the motion of the latter is due to the soul. On the other hand, this motion is not ascribed to the soul because of its being a better form of motion, and yet it is just for this reason that God must have endowed the soul with circular movement, firstly, because 24 motion is better than rest, and secondly, circular movement is better than any other kind. Inasmuch as this inquiry belongs more properly to other branches of knowledge, let us dismiss it for the present. We may, however, note one contradiction found in this and most other theories of the soul. It consists in attaching the soul to the body and placing it therein, without determining why this should be the case, and how the body is 25 related to the soul, although it would seem to be necessary to know this. For it is by virtue of this union that the one acts and the other is acted upon, that the one receives and the other imparts motion—correlations which are not found in things with merely accidental 26 associations. These theories simply attempt to explain the nature of the soul, but add no explanation of the body as its receptacle, because they suppose (in the spirit of the Pythagorean myths[1]) that any soul can clothe

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[1] More particularly in the myth of transmigration.

itself in any body. This cannot be true, for every body appears to have a distinct form and character. Their doctrine is very much like saying that the carpenter's[1] art clothes itself in flutes, whereas an art employs its own instrument, just as a soul employs its own body.

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[1] The carpenter's art finds its physical and material expression in a house but not in a flute; further, it uses not a flute, but an axe, as its tool. A particular house is the expression of a particular art or of particular ideas, just as a particular body is the expression of a definite and individual soul. The soul is the entelechy and formative force of the body, and in it we look for the individuality and significance of the man. It is precisely on the relationship between soul and body that Aristotle lays especial stress in his definition of the former.

CHAPTER IV.

THERE is another theory of the soul handed down from our predecessors, which to the minds of many persons is no less convincing than the theories already described. Account has been taken of it even in our popular treatises. This theory regards the soul as a sort of harmony.[1] Harmony, say its advocates, is a mixture and combination of opposites. The body, too, is com-
2 posed of opposites. Although it is true that harmony is a sort of relation in mixed parts or a combination of parts, we maintain that it is impossible for the soul to be either of these. Again, although motion is not an attribute of harmony, yet almost all of the philosophers
408 *a* who hold the theory of harmony, I may say, ascribe motion to the soul. Another objection is that it is more fitting to apply the term harmony to conditions of health or to bodily qualities in general than to the
3 soul. This becomes most evident when one attempts to describe the effects and functions of the soul in terms

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[1] The reference is to the theory discussed in the *Phaedo* by the guests of Socrates,—Simmias and Cebes, pupils of the Pythagorean Philolaus. *Vid. Phaedo*, 86 A ff.

of harmony; for it is difficult to find any correspondence between them. Now, if we have two sorts of harmony in mind when we use this term, viz. harmony in the primary sense, which means such composition of magnitudes in objects possessing motion and position that they fuse together and admit nothing further that is homogeneous, and in the secondary sense, a ratio in mixed elements,—we still object that in neither sense 4 does harmony apply to the soul. The composition of the parts of the body can be readily examined. There are manifold combinations of the parts, which may be effected in many ways. Of what parts, then, is reason a combination and how is the combination effected? And I raise the same question regarding the sensitive and appetitive soul. It is equally absurd to regard 5 the soul as a ratio of mixture. The mixture of the elements, in the formation of flesh and bone, is not in the same ratio. If all the parts of the body are composed of mixed elements, and the ratio of this mixture constitutes harmony and soul, we have the absurd result that we possess many souls distributed through the entire body. One might demand from Empedocles an 6 answer to this question, for he says that every one of these mixed elements is determined by a given ratio.[1] Now the problem arises whether the soul is this ratio or is something else begotten in the members. Again, is Love the cause of any chance mixture or only of a mixture in which a fixed ratio is observed? And is Love this ratio or something transcending the ratio and different from it? This theory, then, involves such 7

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[1] Cf. Burnet, *Early Greek Philosophy*, p. 227.

difficulties as the foregoing. If the soul is different
from the mixture or combination, why in the world is
it that the soul is annihilated at the same moment as
the existence of the flesh and the other parts of the
living being? Furthermore, if each part does not have
a soul, on the ground that the soul is not the ratio of
mixture, what is it that is destroyed when the soul
8 leaves the body? It is therefore clear from the foregoing
that one cannot regard the soul as a harmony
or its motion as circular. It is, however, possible for
it to be moved accidentally and to move itself, as *e.g.*
that in which it is may be moved, and this in turn
may be moved by the soul. But spatial movement is
9 otherwise impossible for the soul. One might with
better reason raise objections against the movement of
408 *b* the soul, by regarding the following facts. We speak
of the soul as feeling pleasure, pain, courage, fear, and
anger, and as perceiving and thinking. Now all these
processes are apparently movements, and on this ground
10 one might suppose that the soul is moved. This, however,
is not necessarily so. For even if the feeling of
pleasure or pain and the process of thinking be movements
in the highest sense of the term, and each of these be
a movement, it is possible that the movement is produced
by the soul just as the feeling of anger or fear
is effected by a given movement of the heart and
thinking by a movement either of this or of some other
sort. Further, some of these movements are local, others
are processes of change, but of what particular sort or
how effected must be considered elsewhere. However,
11 to speak of the soul as feeling anger is like speaking

of the soul as weaving, or building a house. It is better
not to speak of the soul as feeling pity, or as learning
or thinking, but rather of man doing this through the
soul. We must not suppose, however, that this is so 12
because there is movement in the soul, but that move-
ment sometimes proceeds to the soul and sometimes from
it, as *e.g.* in sensation movement proceeds from outside
objects, in recollection the movement is from the soul
to excitations or fixed impressions lingering in the sense-
organs. Now, reason appears to be an entity which is Δ
implanted in the soul and is incapable of being destroyed;
for if it were perishable it would be destroyed by the 13
decay of old age more than by anything else. As a
matter of fact, the case is the same as that of the
sense-organs; for if the old man could have the eye of
a young man he would see as well as the latter. Old
age, then, does not come because the soul has undergone
some change, but the change is in the soul's organ, the
body, as is the case in drunkenness and disease. 14

Thought and contemplation are, it is true, weakened
when some other internal organ is destroyed, but the
principle itself is unaffected. The processes of discursive
thought and the feeling of love or hate are not affections
of the reason,[1] but of that which has reason in it, in so
far as it has it. Therefore, when this organism is
destroyed there is no longer either memory or love. For 15
these are not affections of the reason, but of that union
of soul and body which has perished. Reason, on the
other hand, is something of a divine nature, and is

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[1] These processes are not affections of the eternal and separable Active Reason, but only of the body in so far as it possesses psychical life.

unaffected by these changes. From these facts, therefore, it is clear that the soul is not in motion; but if it is not in motion at all, it is clear that it is not self-moved.

16 By far the most unreasonable of the above-mentioned
theories is the one which describes the soul as a self-
moving number,[1] involving, as it does, impossibilities.
In the first place, it involves impossibilities regarding its
movement and especially regarding the notion of number.
409 a For how are we to conceive of a monad, a thing which is
without parts and without differences, as in motion, and
by what impulse and in what manner? If it imparts
motion and is moved, it necessarily contains differences.
17 Again, since it is said that a line in motion generates a
plane and a point generates a line, then the movements
of monads will be lines, for a point is a monad which has
position. And the number of the soul is, of course,
18 somewhere, and has position. Again, if from a number
one subtracts a number or a unit, the remainder will be
a different number. But plants and many animals, when
19 cut in two, live and appear to retain the same specific
soul. It would also appear that there is no difference in
speaking of monads and of small bodies. For if the
atoms of Democritus are regarded as points, and quantity
alone remains, there will still be in this quantitative
element, as in everything continuous, a moving and a

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[1] The theory of Xenocrates. This theory is really a theory of harmony. Xenocrates appears to have conceived of the elements of the soul as commingled in such ratio as to produce a harmony (cf. Themistius, ed. Spengel. p. 61). The real nature of this harmony is due to the numerical ratio, and consequently the essential nature of the soul is found in number. This is merely an application of the number theory of the Pythagoreans to the explanation of the soul, to which, however, Xenocrates adds the important notion of self-movement.

moved factor. And this consequence is due not to any difference inside, but merely to the fact that the elements are quantitative. There must, therefore, be something 20 which sets the monads in motion. But if the soul is the cause of animal movement, it will also be the cause of movement in the number; the soul is therefore not at once the moving and the moved principle, but the moving principle alone. How then is it possible for the 21 soul to be moved? There must be some difference between it and other monads. But what difference can there be in monadic points, excepting a difference in 22 position? Therefore, even if the monads and points in bodies differ from each other, the monads will, nevertheless, be in the same space as the points. For the monad will occupy the space of a point. Now what is to prevent an infinite number from occupying the same space, if two can occupy the same space? This supposition, however, is absurd; for where the space occupied by bodies is indivisible, the bodies themselves are indivisible. 23 But if the points in bodies are the number of the soul, or if the soul is the number generated out of corporeal points, why is it that not all bodies have a soul? For, presumably, there are points,—even an infinite number of points,—in all bodies. Again, how is it possible for souls to be separated and disintegrated from bodies,[1] if it be true that lines cannot be divided up into points.[2]

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[1] Xenocrates and the Platonists in general supported the doctrine of immortality and the separability of the soul from the body. Aristotle here attempts to disprove the number theory of the soul by showing its incompatibility with the tenet of separability, and the consequent inconsistency of the Xenocratean philosophy with itself.

[2] Points are not parts of lines, but only definite positions or boundaries.

CHAPTER V.

THE peculiar absurdity of the number-theory consists, as we said above, on the one hand in the fact that those who advance it maintain the same position as the supporters of the theory that the soul is a subtle body; on the other hand, in their explaining the movement of the body by
409 *b* means of the soul after the manner of Democritus. For if there is a soul in every body capable of sensation, there must be, on the supposition that the soul is body, necessarily two bodies in the same space. Again, those who maintain the numerical theory[1] of the soul become involved in the absurdity either that there are many points in a single point, or that every body has a soul, unless they make a distinction between physical and
2 psychical points. The consequence is that the animal is moved by number, in the same way in which we said Democritus explained its motion.[2] For what is the difference whether we speak of the movement of small

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[1] By interpreting the number-theory of Xenocrates as self-moving monads, Aristotle reduces it to similarity with the atomic theory of Democritus, and applies the criticisms of the latter to the former.

[2] The animal is moved by psychical monads, just as in the theory of Democritus it is moved by psychical atoms (cf. *De an.* 406*b* 20).

spherical bodies or of large monads or of monads at all? For in either case the animal movement must be due to the motion of the monads. The above 3 objections and many similar ones may be raised against the third[1] class of philosophers who combine motion and number in their theory. This is not merely an impossible definition of the soul; it is even an impossible attribute. This becomes evident if one tries to explain in terms of 4 this motion[2] the feelings and functions of the soul, such as deductions, sense-perceptions, pleasure and pain, and similar processes. It is not easy, as we said above,[3] in terms of such a theory, to form even a conjecture of the nature of these functions. Of the three[4] traditional 5 explanations of the soul, there is one which describes the soul as the most mobile element because of its self-movement; there is another which describes it as the most subtle or incorporeal element. The difficulties and contradictions involved in these two have been pretty fully explained. There remains for us the consideration of the theory of its composition from the elements. The 6 soul is composed of the elements, certain philosophers say, in order that it may perceive and know all reality. But there are many difficulties which make this theory impossible. Its advocates assume that like is known by like, thus making the soul and its object in a sense identical. But the soul knows not merely these elements; it knows a great number, one would better say an infinite 7 number, of other things, derivatives of the elements. Let it be granted that the soul knows and perceives the elements in every real thing; by what means is it to know or perceive the concrete object, *e.g.* what is God, or man, or flesh, or bone, or any other similar composite 410*a* thing? For the elements are not combined in any haphazard way to form things, but in a fixed ratio and composition, as Empedocles himself says in regard to bone:[1]

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[1] Xenocrates and the pythagorizing Platonists.

[2] In terms of number.

[3] *De an.* 408*b* 32.

[4] The explanations apparently referred to are: (1) that which regards the soul as a self-moving number (Xenocrates); (2) that which regards it as composed of the finest and most mobile atoms (Democritus), or of the subtlest substance (Anaxagoras), or perhaps as consisting of Harmony (Plato); (3) that which regards it as composed of the elements. This third class of theories lays chief weight on the soul as an instrument of cognition.

> "Earth, the lovely, in her smelting pots, broad moulded,
> Obtained from sparkling Nestis[2] two parts of the eight;
> Four from Vulcan's fire: so were white bones begotten."

8 There is, therefore, no advantage in having the elements in the soul unless the ratios and combinations are also to be found in it. Each element will know its similar counterpart, but it will not know bone or man unless these also are to be found in it. One need scarcely say that this is impossible. For who could be in doubt whether a stone or man were to be found in the 9 soul? The same holds true of the good[3] and the not-good, and equally of other instances. Again, inasmuch as the term 'Being' is employed in several meanings (it

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[1] *Vid.* Burnet, *Early Greek Philosophy*, p. 227; Ritter and Preller, *Hist. Philos. Graec.*, 8th ed., p. 143.

[2] Water.

[3] To Aristotle the good is not an entity or element, and so is not explicable by the theory of Empedocles. The good is a relation, and consists in being a mean between two extremes, both of which (excess and defect) are evil.

denotes *e.g.* the individual concrete thing, or quantity, or
quality, or some other particular category), the question
arises whether the soul is composed of all these cate-
gories. It is supposed that there are no elements which
are common to all the categories. Is the soul, then, 10
composed only of the elements which fall under the
category of substance? If so, how does it cognize the
other elements? Are we to say that there are elements
and specific principles which belong to every category of
existence, and that the soul is composed of these? The
soul will then be a quantity, a quality, and a substance.
Now, it is impossible to form a substance or anything
but a quantity out of elements of quantity. These and
similar objections may be urged against the theory that 11
the soul is composed of all the elements. Again, it is
absurd to say that like is unaffected by like, and yet
maintain that like perceives like, and that we know like
by like. At the same time these writers regard per-
ception, as well as thinking and knowing, as a sort of 12
affection and movement. The theory, as Empedocles[1]

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[1] Empedocles starts with the psychological principle that like is known by like. Consequently, if objective reality, which consists of the four elements (fire, earth, air, and water,) is to be known, then the knowing soul must be composed of the like elements. Aristotle's objections are as follows: (1) The soul not only knows the elements, but a great many other things, for which the Empedoclean theory that 'like is known by like' makes no provision. (2) It is of no value that the soul consist of the elements, unless in some way it be made to consist of the ratios and combinations of these elements. How, *e.g.*, can man or stone be known, for no one supposes that either of these is in the soul? (3) In what category is the soul to be classed? It cannot be regarded as all of them, for the different categories have no common elements, and if it is referred to one or the other of the ten categories, it will know only the objects that belong to this category, while it will be ignorant of the others. (4) Empedocles is further in the dilemma of

states it, that things are severally cognized by means of
somatic elements and that like elements are cognized by
like, is open to many objections and difficulties, as is
proven by what we have just said. For it is plain that
such elements in animal bodies as are composed merely of
410b gross matter, like bones, sinews, and hair, do not perceive
anything, not even objects like themselves. According to
13 the theory, however, they ought to perceive the like.
Further, more ignorance than knowledge will attach to
every element; for it will know only one particular
thing, while it will be ignorant of much, for its ignorance
will extend to everything else. And Empedocles is in
the dilemma of making God the most unintelligent of
beings; for he alone is ignorant of one of the elements.
viz., Strife, while mortals know them all, because they
14 are formed from them all. There is, further, this general
question to be raised: Why is it that all entities do not
possess a soul, since everything is either an element or a
derivative of one or several or all of the elements, and
15 must, therefore, know one thing or certain things or all
things? One might raise the further query: What is it
that unifies these elements into objects? The elements
are like a corporeal substrate, while it is the unifying
principle, whatever that may be, that is the main thing.
But there can be no superior principle to dominate the
soul. This impossibility applies most of all to reason.
For reason is, with good cause, called nature's first-born

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making God the most ignorant of beings, because one (vid. Ueberweg-Heinze, 8th ed., Th. i., p. 83) of the elemental cosmical principles—'Strife'—is excluded from his nature. (5) Again, why does not every element or combination of elements possess a soul? (6) The theory of Empedocles provides no unifying principle.

ruler, although these philosophers regard the elements as the primary realities. All the philosophers who maintain 16 the doctrine that the soul is composed of the elements because it knows and perceives realities, and those who describe it as the most mobile entity, fall into the error of not referring to the soul in its entirety. For not every sentient creature is capable of movement.[1] Certain animals are observed to be stationary in place. And yet this seems to be the only form of movement that could be meant when one says 'the soul moves the animal.' A similar objection may also be urged against those who 17 describe the soul and the sentient principle as composed of the elements, viz., that plants evidently live without participation in movement or sensation, while many animals are not endowed with thought. But even if one were to make a concession and regard reason as a part of the soul, in a sense similar to that in which the perceptive faculties are parts of the soul, still even then one would not be taking every form of soul into consideration, nor the whole of any particular soul. And this is just what happens in the account of the soul given 18 us in the Orphic verses, as we call them.[2] For there we are told that the soul enters from the universe into individuals as they breathe, and that it is carried by the air. But this is impossible in the case of plants and also in the case of certain animals; because not all of 411 a them breathe—a fact which the supporters of this view 19

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[1] This objection appears to apply not to Empedocles, but to Democritus and Xenocrates. Motion cannot belong to the essential nature of soul, for certain sentient creatures are stable and incapable of motion.

[2] Aristotle evidently considered the Orphic origin of these early Cosmogonies as a doubtful tradition.

have overlooked. Even if we admit that the soul must
be composed of the elements, it is not necessary that it
be composed of all of them; for either member of two
contraries is competent to discern both itself and its
20 opposite. For example, by the concept of the straight
we discern both the straight and the crooked; the rule is
the test for both, while the crooked is not a test either of
itself or of the straight.

Certain philosophers[1] maintain that the soul is diffused
throughout the universe, which may account for Thales'[2]
thinking that all things are full of gods. This view is also
21 attended by certain difficulties. Why is it that the soul
which is in the air or in the fire does not generate an
animal, while such generation takes place in compound
bodies, although they regard that which is contained in
the former elements as superior to that which is contained in compound bodies. One might also ask the
question: Why is it that the soul contained in the air is
better and more imperishable than that which is found
in the animal body? There is a two-fold objection to
22 this theory: it involves an inconsistency and a paralogism.
To speak of fire or air as animal is paralogistic; while
not to call them animal, if they have a soul, is inconsistent. They appear to think there is soul in these
23 elements on the ground that the whole is homogeneous
with its parts. The result is, they must say that the

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[1] The reference here may be to the theories advanced in the *Timaeus* (30 B, 34 B; cf. Barthélemy-St.-Hilaire, *Psychol. d'Aristote*, p. 155, and Themistius *Comment. ad loc.*), or to the theories of Heraclitus or Empedocles or Diogenes of Apollonia. The theory of panpsychism is best represented by the post-Aristotelian Stoics.

[2] *Vid.* Burnet, *Early Greek Philosophy*, p. 42.

soul is homogeneous with its parts, if it be true that animals become endowed with soul by taking into themselves something from their environment. If, however, the diffused air is homogeneous, and the soul consists of heterogeneous parts, it is evident that some of its parts and not others will be contained in the air. The 24 consequence is that the soul must either consist of like parts or not be found in every element of the universe.

From the aforesaid it is evident that knowledge does not belong to the soul in virtue of its composition out of the elements, neither is it right or true to say that it is moved. But inasmuch as cognition, sense-perception, 25 and opinion, as well as appetite, volition, and desire in general are functions of the soul, and inasmuch as locomotion in animals is effected by the soul, and it is also by virtue of the soul that animals grow, reach their prime, and decay, the question arises whether each of these functions is to be ascribed to the entire soul. In other 411 A words, is it by means of the entire soul that we think, perceive, and are moved, and perform and undergo every other process, or do we perform each different function by means of a different part? Again, we may ask whether 26 the principle of life is found in each one of these parts or in several or in all of them. Or is something other than the soul[1] the cause of life? It is true that some writers maintain the divisibility of the soul and that one part exercises thought and another part exercises desire.

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[1] According to Aristotle, life is one of the psychical functions, although the most elementary of all of them, and is a prerequisite to all other forms of psychical activity.

27 If the soul is really divided in its nature, what is it that
holds it together? It is certainly not the body; for, on
the contrary, one supposes that the soul holds the body
together. At any rate, when the soul departs the body
is dissolved and disintegrated. If, therefore, it is something
other than the body that makes the soul an unit
this would assuredly be the soul itself, and we shall
be obliged to inquire again whether that unifying
principle is itself an unit or is composed of several parts.
28 If it is an unit, why should we not say at once that the
soul is an unit? But if it is divisible, reason will again
ask what that principle is which holds it together, and so
the process will go on *ad infinitum*. In regard to the
parts of the soul, one might inquire concerning the power
29 which each of them has in the body. For if it is the
soul as a whole that binds the entire body together, it
would be fair to suppose that each part of the soul is the
binding principle for some part of the body. This, however,
appears to be impossible. It is hard even to fancy
what sort of part the reason will bind or in what way.
30 It is observed also that plants and certain insects, when
divided, continue to live, because the sections possess
souls, which are specifically, although not numerically,
the same. Each part retains the power of sensation
and locomotion for some time, and there is nothing
strange in the fact that it does not continue to live,
31 because it has no organ for the maintenance of its nature.
Nevertheless the parts of the soul are all found in every
one of these bodily divisions, and they are of like kind
with each other and with the entire soul; of like kind
with each other because they are mutually inseparable;

of like kind with the entire soul because it is divided into these as parts. Again, the fundamental principle of life in plants appears to be a kind of soul and this is the only principle which animals and plants have in common. The principle of life can exist apart from sensation, but no sentient thing can exist without life.

BOOK THE SECOND.

CHAPTER I.

412*a* LET the foregoing suffice as a discussion of the traditional
theories of the soul; and now let us resume our subject
from the start, and attempt to determine the nature of
2 the soul and its most general definition. One class of
realities we call 'substance.' This 'substance' may be regarded
on the one hand as matter, which in itself is no
definite thing; on the other hand, as form and idea, in
terms of which definite individuality is ascribed to a
thing. A third meaning of substance is the composite
of matter and form. Matter is potentiality; form is
actuality or realization.[1] The latter may be looked at

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[1] The notions here under discussion belong to the most fundamental with which the philosophy of Aristotle operates. The soul is characterized by several terms, chief of which are *form* and *entelechy*. Every individual or 'substantial' thing is a composite of form and matter. Form is that which gives a thing its character or significance. It is form, therefore, that is the object of knowledge. Becoming consists in the process of matter assuming a definite form. Matter, consequently, represents the potentiality of a thing, and form its actuality. Viewed from the standpoint of causation or process, these two notions constitute the material and formal causes; in other words, matter is the condition *sine qua non*, while the form is conceptual, efficient, and final cause.

in two ways, either as complete realization,—comparable with perfected knowledge, or as realization in process,—comparable with the activity of contemplation. The 3
notion of substance appears to be most generally employed in the sense of body, and particularly of physical body: for this is the source of all other bodies. Some physical bodies have, and others have not, life. By life we understand an inherent principle of nutrition, growth, and decay. So that every natural body endowed with life would be substance, and substance in this composite sense. 4
The body, therefore, would not be soul, since body is of

These fundamental terms in Aristotle's metaphysics are applied by him to the explanation of the soul. Man is first of all an organic whole, the living force in which is the soul, while the body is the soul's organ. Soul is that which differentiates a living from an inanimate thing, (*De an.* 413*a* 33), and life signifies a process or a form of motion. Life implies, further, an active and a passive element; in other words, a moving principle and a thing moved, which in Aristotle's terminology are form and matter. Form here is equivalent to the moving or efficient cause. It is the energy or life that determines the growth of a particular body, or its transition, in Aristotelian language, from potentiality to actuality. Every living thing, then, is a composite of form and matter, or soul and body. In so far as the form is the perfected end or final cause, in so far Aristotle describes the soul as the entelechy of a natural organic body. In so far as it is an efficient power or moving cause, he describes the soul as the actuality or actualization (an inadequate translation of ἐνέργεια). It is only in the "soul that body attains its true reality" (Wallace, Introd. p. xxxix.). Soul is the realization of the body, apart from which the body is only formless, undeveloped, potential matter. Entelechy (ἐντελέχεια) means the finished state of a thing (*Phys.* 202*a* 24) or a state in which a thing's potentiality finds its complete development. Actualization (ἐνέργεια), on the other hand, means the active process by which the potential thing passes over into the completed state or it is the completed state in process. Entelechy is, therefore, more ultimate than actualization (ἐνέργεια), although Aristotle frequently uses the terms synonymously. On the term ἐνέργεια, *vid.* Grant's *Aristotle's Ethics*, Vol. I., pp. 231 ff. 4th ed., and Trendelenburg's *Aristotle's De anima*, 2nd ed., pp. 242 ff.

such nature that life is an attribute of it. For body is not predicated of something else, but is rather itself substrate and matter. The soul must, then, be substance[1] in this sense: it is the form of a natural body endowed with the capacity of life. In this meaning
5 substance is the completed realization. Soul, therefore, will be the completed realization of a body such as described. Complete realization is employed in two senses.[2] In the one sense it is comparable with perfected knowledge; in another, it is comparable with the active process of contemplation. It is evident that we mean by it here that realization which corresponds to perfected knowledge. Now, both waking and sleeping are included in the soul's existence: waking corresponds to active contemplation; sleep to attained and inactive knowledge. In a given case science is earlier in origin[3]
6 than observation. Soul, then, is the first[4] entelechy

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[1] Substance is employed by Aristotle in three senses: (1) matter; (2) form; (3) the composite of matter and form or an individual thing. Cf. Zeller's *Aristotle*, Engl. tr. Vol. I. pp. 374 ff.; Grote's *Aristotle*, p. 454.

[2] These two senses are described by Aristotle in the terms entelechy and actualization (ἐνέργεια), the former of which corresponds to 'perfected knowledge' and the latter to the process or activity of 'contemplation.'

[3] In the sense of being a dormant possession, or a potentiality which subsequent activity presupposes.

[4] The 'first' entelechy is variously explained by the different commentators from Simplicius down. The notion of 'first' appears to refer to the distinction made in the previous Note. There is a primary and secondary substance (οὐσία), the former of which refers to the individual, and the latter to the genera; there is a primary matter (πρώτη ὕλη, *Metaph.* 1049*a* 25), which signifies matter absolutely formless; there is, further, a primary soul (πρώτη ψυχή, *De an.* 416*b* 22), which is the most fundamental or primary form of soul, viz., the nutritive function; and similarly there is a first entelechy (πρώτη ἐντελέχεια), which is the primary or most fundamental form of psychical life. It is primary or

of a natural body endowed with the capacity of life.
Such a body one would describe as organic. The parts
of plants are also organs, although quite simple in char- 412 *b*
acter, *e.g.* the leaf is the covering of the pericarp, and
the pericarp is covering of the fruit; the roots are
analogous to mouths, both being channels of nutrition. 7
If then we were obliged to give a general description
applicable to all soul or life, we should say that it is the
first entelechy of a natural organic body. It is therefore
unnecessary to ask whether body and soul are one, as one
should not ask whether the wax and the figure are one,
or, in general, whether the matter of a particular thing
and the thing composed of it are one. For although
unity and being are predicated in several senses, their
proper sense is that of perfect realization.

We have now given a general definition of the soul. 8
We have defined it as an entity which realizes an idea.
It is the essential notion which we ascribe to a body
of a given kind. As an illustration, suppose that an
instrument, *e.g.* an axe, were a natural body. Here the
notion of axe constitutes its essential nature or reality,
and this would be its soul. Were this taken away it
would no longer be an axe, except in the sense of a
homonym. It is in reality, however, merely an axe, 9
and of a body of this sort soul is not the notional

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first in the sense of being nearest to mere potentiality, and in the order of development stands next above body. It is also first in being a prerequisite to all further development. The 'first entelechy of a body' is, consequently, the first manifestation of life which an organism displays. It corresponds to dormant knowledge or merely possessed science, which is potentiality (*δύναμις*, *ἕξις*) compared with the active employment of science (*ἐνέργεια*), and as potentiality, it is prior to the latter. (Cf. Zeller's *Aristotle*, Engl. tr. Vol. II. p. 3, note 1.)

essence and the idea, but soul applies only to a natural body of a given kind, viz. a body whose principle of movement and rest is in itself.[1] The principle expressed here should be observed in its application to particular parts of the body. For if the eye were an 10 animal, vision would be its soul, *i.e.* vision is the notional essence of the eye. The eye, however, is the matter of vision, and if the vision be wanting the eye is no longer an eye, save in the meaning of a homonym, as a stone eye or a painted eye. What applies here to a particular member, must also apply to the entire living body; for as the particular sensation is related to the particular organ of sense, so is the whole of sensation related to the entire sensitive organism, in so far as it has sensa- 11 tion. 'Potentiality of life' does not refer to a thing which has become dispossessed of soul, but to that which possesses it. Seed and fruit are potentially living bodies. As cutting is the realization of the axe, and vision is the realization of the eye, so is the waking state the realization of the living body; and as vision and capacity 413*a* are related to the organ, so is the soul related to the body. Body is the potential substrate. But as vision and pupil on the one hand constitute the eye, so soul and body in the other case constitute the living animal. 12 It is, therefore, clear that the soul is not separable from the body; and the same holds good of particular parts of the soul, if its nature admits of division, for in some cases the soul is the realization of these very parts;

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[1] The meaning is that if an axe were a body with an inherent principle of movement, or in other words an animate body, then the notion of axe or axehood would constitute its soul. The soul, then, is the 'notional essence,' to use an Aristotelian phrase, of a living body.

not but that there are certain other parts where nothing Δ forbids their possible separation, because they are not realizations of any bodily nature.[1] And yet it is uncertain whether the soul as realization of the body is Δ separable from it in a sense analogous to the separability of sailor[2] and boat. Let this suffice as a definition and outline sketch of the soul.

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[1] The reference is to the Active Reason.

[2] As the sailor is the directing and animating principle, as it were, of a boat and is able to leave it at will.

CHAPTER II.

INASMUCH as the certain and the conceptually mo
knowable is derived from what is uncertain,[1] but sensibl
more apparent, we must resume the investigation of t
soul from this standpoint. For it is necessary that t
definition show not merely what a thing is, as mo
definitions do, but it must also contain and exhibit t
2 cause of its being what it is. In reality, the terms
definitions are ordinarily stated in the form of co
clusions. What, *e.g.* is the definition of squaring? T
reply is that squaring is the conversion of a figure
unequal sides into a right-angled equilateral figure equ
to the former. Such a definition is the expression
a conclusion. But to define squaring as the discove
3 of a mean proportional line is to define the thing

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[1] The only certain and scientific knowledge to Aristotle is that
concepts or universals, although this is in a way derived from sensi
data. Aristotle is not, however, a pure Empiricist. Sense-p
ception itself is not a passive reception of external impressio
these furnish rather only the occasion of a given psychical activi
and rational thought is in still higher degree a matter of subject
initiation. He rejects, however, the Platonic theory of reminisce
and all other theories which assume the possession of a body of inn
truths.

terms of its cause.[1] Resuming our inquiry, we say, therefore, that the animate is distinguished from the inanimate by the principle of life. But inasmuch as life is predicated in several senses, *e.g.* in the sense of reason, sensation, local movement and rest, and furthermore movement in the sense of nutrition, decay, and growth;[2] 4

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[1] The one definition describes the result accomplished, and the other the means and method of its accomplishment. Although Aristotle has great veneration for facts, to a degree remarkable in Greek philosophy, he constantly lays emphasis on the superior significance of relations and causes.

[2] Aristotle's view of soul or the 'vital principle' (neither translation gives quite an adequate idea of the meaning of ψυχή, cf. Introduction, Chap. i.) is different from that of Stahl and the Montpellier School of Animists. The latter regard the mind as the source of all vital phenomena, whereas Aristotle regards life as the source of mind, or rather, mind as only one of several forms of life. The distinction between the two views is made greater by Lewes (*Aristotle*, p. 223) than the facts justify, he having, as he supposes, made the discovery of this distinction. In reality Aristotle characterizes life as a psychical activity, though not necessarily intelligent. The organic activity in plants is psychical, although they have no sensation. Aristotle used life in a wider meaning than we do; with him it included reason and sensation, as amongst the vital activities of organized beings. These combined activities constituted 'soul' in distinction from the material substrate or body, in which they are manifested. Stahl (1660-1734), whose theory of the soul grew out of his physiological studies and was a reaction against mechanical and chemical theories, rejects the Aristotelian distinction of a vegetative and nutritive soul, and refers all these functions to rational thought. The three forms of vital movement for Stahl are the circulation of the blood, secretion, and excretion, all of which Aristotle includes amongst the activities of nutrition, save that the circulation of the blood takes the form of movement from the heart to the extremities and back again. Stahl says the cause of this is the mind; Aristotle says it is the nutritive soul or the lowest form of vital activity. Both are vitalists in the repudiation of a mechanical explanation of life; both are animists in referring the phenomena of life to the soul. They differ in that Stahl makes all these activities rational, while Aristotle regards as rational only specific activities in higher animal life. Cf. Lemoine, *Le vitalisme et l'animisme de Stahl*, pp. 33 ff.

if any one of these is discerned in a thing we say that it has life. All plants, therefore, are supposed to have life; for evidently they have within them a potency and principle whereby they experience growth and decay in opposite processes. For their growth is not merely upwards or downwards, but in both these directions alike and in every point where nutrition takes place, and they continue to live as long as they are capable of
5 nutrition. Now this faculty of nutrition is separable from the other forms of life, but the other forms cannot exist in perishable creatures apart from this principle of nutrition. This is made clear in the instance of plants; for they have no other capacity of soul (or life)
413 *b* than this nutritive one. Owing to this fundamental
6 principle of nourishment, therefore, life is found in all animated living things, but the primary mark which distinguishes an animal from other forms of life is the possession of sensation. For even those creatures which are incapable of locomotion or change of place, but which possess sensation, are called animals and are not merely said to live. Touch is the primary form
7 of sensation and is found in all animals. But as the nutritive faculty is separable from touch and sensation in general, so touch can exist apart from the other forms of sensation. By the nutritive power we understand that part of the soul in which plants share; and by the sensation of touch we mean that capacity which all animals possess. We shall later on give the explanation of these phenomena.

8 For the present let it suffice that the soul is the causal principle of the aforesaid phenomena, and is

defined in terms of them, I mean, in terms of nutrition,
sensation, reason, motion. To the question whether each
of these forms of life is a soul or a part of the soul;
and, if a part, whether in the sense that the part is
only notionally separable or really separable in space,—
the reply is in some respects easy and in others
difficult. For in the case of plants, some of them appear 9
to live when they are divided up and the parts are
separated from each other, indicating that there is in
each of these plants in actuality an unitary soul, but in
potentiality several souls. And we observe the same
thing taking place in different varieties of soul, as *e.g.* in
the case of insects which have been dismembered. Here
each part is capable of sensation and locomotion, but if it
is capable of sensation it is also capable of imagination
and impulse. For where there is sensation, there is also
pleasure and pain, and where there is pleasure and pain
there is necessarily also desire. ✓Now in regard to reason 10
and the speculative faculty, we have as yet no certain
evidence, but it seems to be a generically distinct type of
soul and it alone is capable of existing in a state of
separation from the body, as the eternal is separable from
the mortal.[1] The remaining parts of the soul, however, 11
are from the foregoing considerations evidently not
separable, as some assert.[2] But that they are notionally

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[1] Amongst the uncertain and wavering statements of Aristotle regarding the separability of the rational soul and its immortality, this is one of the most explicit passages.

[2] The reference appears to be to Plato who regarded the soul as consisting of three distinct faculties,—the rational, spirited, and appetitive (*Repub.* 440 A, B, *Timaeus*, 69, 70), which were situated in different parts of the body,—reason in the head, the spirited element in the thorax, and the concupiscent faculties in the lower body.

separable, is clear; for if perceiving is distinct from opining, the faculty of sensation or perception is distinct from that whereby we opine, and each of these is in turn distinct from the faculties above mentioned.
12 Furthermore, all of these are found in some animals, while only certain of them are found in others, and in still others only a single one (and this is the cause of dis-
414a tinctions amongst animals). The reason for this must be investigated hereafter. A parallel instance is found in regard to sensation; some animals possess all the faculties of sense, others only certain of them, and still others only the single most fundamental one, viz. touch.

13 The principle by which we live and have sensation, then, is employed in a twofold sense. Similarly, we employ the principle by which we know in a twofold sense, viz. science and the knowing mind (for we say we know by means of each of these), and in a like manner the principle by virtue of which we are healthy is in one
14 sense health itself, and in another sense a part of the body or the whole of it. In these cases knowledge and health constitute the form, notion, idea, and, as it were, the realization of a potential subject,—the one of a knowing subject and the other of a healthy one, (realization is supposed to attach to that which has power to effect changes and is found in a passive and recipient subject). The soul is that principle by which in an ultimate sense we live and feel and think; so that it is a sort of idea and form, not matter and substrate.
15 Now, substance is employed, as we have said, in a threefold meaning, viz. as form, as matter, and as a composite of these two. Amongst these meanings of substance

matter signifies potentiality; form signifies actuality or complete realization. Inasmuch as it is the composite which is the animate creature, body cannot be regarded as the complete realization of the soul, but the soul is the realization of a given body. The conjecture, therefore, 16 appears well founded that the soul does not exist apart from a body nor is it a particular body. The soul is not itself body, but it is a certain aspect of body, and is consequently found in a body, and furthermore in a body of such and such a kind. It is not to be regarded as it was amongst our predecessors who thought that it is introduced into body without prior determination of the particular sort of body, although no casual subject appears capable of undergoing any casual or haphazard 17 effect.[1] This same result is also reached by an analysis of the notion itself; for complete realization in every instance is naturally found in a definite potentiality and in an appropriate matter. From this it is evident that the soul is a kind of realization and expressed idea of a determinate potentiality.

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[1] Trendelenburg thinks the Pythagoreans are meant here, owing to their doctrine of transmigration of souls. The doctrine that one soul can clothe itself in different [illegible] of bodies is as impossible as that one craft can use the tools of other crafts indifferently. Cf. *De an.* 407*b* 22; *vid.* also note, p. 25.

CHAPTER III.

In some creatures, as we have said, all of the ab
mentioned psychic powers are found, in others certai
them, and in still others only one. By powers we m
here the power of nutrition, of appetite, of sensat
of movement in space, and of rational thought.
plants, only the nutritive power is found; in ot
414 b creatures the power of sensation is added. If sensa
2 is added, impulse or appetite is also implied.
appetite includes desire and impulse and wish.
animals have at least one sense—touch; and to what
creature sensation is given, to it are also given plea
and pain, and objects appear to be pleasant or pai
Creatures which distinguish these, possess also desire;
desire is an impulse towards what is pleasant. Furt
3 animals possess a sense for food, and this is
sense of touch; for all animals are nourished by m
of the dry and moist, the warm and cold, and it
touch which apprehends these. It is only inciden
that animals discern food through other sens
qualities; neither sound nor colour nor smell
tributes at all to food. Flavour, however, is one of

haptic qualities.[1] Hunger and thirst are desires; hunger is a desire of the dry and warm; thirst a desire of the cool and moist, and flavour is a sort of seasoning in these objects. We must explain these subjects minutely hereafter; for the present let the statement suffice, that amongst animals where we find touch we find appetite also. The subject of imagination in animals is uncertain and must be investigated later. In addition to these attributes we find amongst some animals the power of local movement and in others we find the power of understanding and reason as in man and in other creatures that are, if there be such, similar or superior to man. It is evident that a single definition can be applied to soul in the same way as a single definition can be applied to figure. As in the latter case there is no figure beyond that of the triangle and its derivations, so in the former case there is no soul beyond those enumerated. A common definition might also be applied to figures which would fit them all and be peculiar to no particular figure. The same holds good in the case of the above mentioned types of soul. It is therefore, absurd,[2] both in these instances and in others to search for a common definition which shall not apply to any individual real thing nor to any peculiar and proper

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[1] Touch is the most fundamental of all the senses and taste is dependent upon it. These two are essential to the preservation of animal life. No animal can be without touch and nothing that is without it can be an animal. As the primary form of sensation, it is the lowest differential mark of animal life, distinguishing the animal from the vegetable.

[2] Aristotle is referring to an absurdity not fully expressed here. The meaning appears to be that, although such a general definition might be framed, it would be void of any useful content or significance, not being applicable to any particular form of reality.

itself, an animal to beget another animal, a plant another plant, in order that they attain, as far as possible, the
415 *b* immortal and divine[1]; for this is what every creature
4 aims at, and this is the final cause of every creature's natural life. We understand by final cause two things: the purpose aimed at, and the person who is served by the purpose.[2] Since it is impossible for an individual to partake of the immortal and divine in its own continuous life, because no perishable creature continues self-identical and numerically one, it partakes therefore of the immortal in that way in which it is able to share it, one thing in a higher degree and another in a lower; it does not itself abide, but only a similar self abides; in its continuity it is not numerically, but only specifically, one.

5 The soul is the cause and principle of a living body. These terms are used in several senses. Corresponding to these differences, the soul is referred to as cause in three distinct meanings; for it is cause in the sense of the source of movement, of final cause, and as the real
6 substance of animate bodies.[3] That it is a cause in the sense of real substance is evident, for real substance is in every case the cause of being, and the being of animals is their life, and soul is the cause and principle of life. Furthermore, it is the complete realization that gives us the real significance of a potential being. Soul is also

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[1] The only immortality possible for animals unendowed with Active Reason is that of the perpetuation of their species through propagation.

[2] For example, the end or purpose of a lamp may be said to be either (*a*) to give light, or (*b*) to serve the wants of the person who employs the light.

[3] In other words, soul is used in the meanings of efficient, final, and formal cause.

[illegible] thing which the [illegible] primary source of [illegible] movement is not possessed [illegible] formation and growth [illegible] sense-perception is supposed [illegible] formation and [illegible] unless it has a soul. [illegible] and decay. For [illegible] processes unless it [illegible] capable of [illegible] ascribes downward growth to plants [illegible] because the earth naturally [illegible] growth, because [illegible] respects is not right. For Empedocles [illegible] the terms up and down [illegible] are not the same for all things [illegible] universe, for roots are in plants what [illegible] if one is to describe organs as identical [illegible] of their functions. In addition [illegible] hold [illegible]

the real cause of nutrition and growth. For this seems
to be the only body or element that feeds and increases
itself. One might, therefore, conjecture that this is the
element that causes growth and nutrition in animals and
13 plants. In a certain sense, it is true, fire is a co-ordinate
cause, but not the absolute cause, of growth; this is rather
the soul. For the growth of fire is indeterminate so long
as there is material to burn; on the other hand, in all
bodies developed in nature there is a limit and significance
to size and growth. These attributes ([of limit and
significance]) belong to soul, not to fire, to reason rather
than to matter.

14 Since the same power of the soul is both nutritive and
generative, we must first investigate nutrition; for it is
by this function of nutrition that the faculty in question
is distinguished from other faculties. Nutrition is sup-
15 posed to take place by the law of opposites, although not
every opposite is nourished by every other, but such
opposites only as derive both their origin and their
growth from each other.[1] Many things are derived
from one another, but they are not all quantitative
16 changes, as *e.g.* healthy from sickly. Nutrition is not

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[1] The body is composed of all four elements and its nourishment must include all of them. The animal waste is supplied out of these several elements, which are themselves characterized by opposite qualities, by means of the action of heat and cold. Blood is the final form into which vital heat cooks the raw food. Aristotle makes really little use of the physical explanations of the Pre-Socratics, who were satisfied to explain all cosmical phenomena by such opposing forces in nature as heat and cold, the moist and dry, the heavy and light, etc. Although Aristotle still makes use of these ideas, in his dynamical theory he sees the world full of final causes, while the purely physical forces of the Pre-Socratics are merely the instruments employed by soul or life.

applied to these cases in the same sense, for while water is nutriment for fire, fire does not nourish water. The opposites of food and nourishment appear to apply particularly to simple bodies. There is, however, a difficulty 17 here. For there are some who maintain that like is nourished by like, as like is also increased by like, while others, as we said, affirm the converse of this, viz., that opposites are nourished by opposites, on the ground that like is incapable of being affected by like. Food, however, undergoes transformation and is digested, and transformation is in every case toward the opposite or 18 the intermediate. Further, food is affected by the body which assimilates it; the latter, however, is not affected by the food, just as the builder is not affected by his 416 *b* material, although the material undergoes change through him. The builder merely passes from a state of inactivity into one of activity. The question whether nourishment is to be understood to apply to the final 19 condition in which it is taken up by the body, or to its original condition, creates a difficulty. If both are meant, only in the one case the food is indigested and in the other digested, it would be possible to speak of nourishment conformably to both of the above theories; for in so far as it is indigested, we should have opposite nourished by opposite; in so far as it is digested, we should have like nourished by like; so that in a certain 20 sense, it is evident they are both right and both wrong. Since nothing is nourished which does not share life, the object of nutrition would be an animate body as animate; so that food is determined by its relation to an animate object and is not accidental. There is a

21 difference between the nourishment and the principle of growth; in so far as the animate thing is quantitative, the notion of growth applies; in so far as it is a particular substance, the notion of nourishment. For food preserves a being as a substantial thing, and it continues to exist so long as it is nourished. Nourishment is productive of generation, not the generation of the nourished thing, but of a being similar to it. For the former
22 exists already as a reality, and nothing generates, but merely preserves, itself. So then, such a principle of the soul as we have described is a power capable of preserving that in which this principle is found, in so far as it is found; nourishment equips it for action. When,
23 therefore, it is deprived of nourishment, it can no longer exist. Since there are three distinct things here: the object nourished, the means of nourishment, and the power that causes nutrition, we shall say that it is the elemental soul that causes nutrition, the object nourished is the body which possesses this soul, and the means of nourishment is the food. And since it is fair to give everything a name in terms of its end, and since here the end of the soul is to generate a creature like to itself, the elemental soul might be called generative of
24 that which is like to itself. The means of nourishment is used in two senses, as is also the means of steering a ship; for one may refer to the hand, or to the rudder, the one being both actively moving and moved; the other only passively moved. All nutriment must be capable of being digested; heat is the element which accomplishes digestion. Everything animate, therefore, possesses heat. We have explained now, in outline, what

nutriment is. The subject must be more minutely treated later on in its proper place.[1]

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[1] Simplicius thinks the reference is to *De gener. animal.* and *De gener. et corr.* Sophonias refers to *De gener. animal.* (724*a* 14). The reference can hardly be to *Περὶ τροφῆς* as Barthélemy-St.-Hilaire (who follows Trendelenburg) supposes. This latter treatise appears to have originated in the Peripatetic School, but from the fact that it made the distinction between veins and arteries it cannot have been Aristotelian, and the reference in *De somn.* 456*b* 5 must have been either to a projected work or to the early chapters of the *Histor. anim.* or to the treatises enumerated by Simplicius. Cf. Zeller's *Aristotle*, Eng. tr., Vol. I. p. 92, note.

CHAPTER V.

Now that we have arrived at the foregoing conclusi
let us discuss in general the entire question of se
perception. It consists, as we have said, in being mc
and affected; for it is supposed to be a sort of inte
transformation. Some maintain that like is affected
417a like. In what sense this is possible and in what s
impossible, I have explained in a general treatise
2 *Activity and Passivity.*[1] A difficulty is raised by
question why it is that perceptions do not arise from
senses themselves, and why it is that without exte
stimuli they produce no sensation, although fire
earth, and the other elements of which we have se
perception, are, either in their essential nature or in t
attributes, found in the senses. It is, therefore, evic
that the organ of sense-perception is not a thing
3 actuality but only in potentiality. It is consequei
analogous to the combustible which does not it
ignite without something to set it ablaze. Otheri
it would have burned itself and had no need of

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[1] Philoponus thinks the reference is to *De gener. et corr.* 323*b* ff.).

active fire. Inasmuch as we say that perceiving is used in two meanings (*e.g.* we call the capacity to hear and see, hearing and sight, although they may chance to be dormant, and we apply the same terms where the senses are actively exercised), so sense-perception also would be used in two senses, the one 4 potential and the other actual. First of all let us understand that the terms affection, motion, and activity, are used in the same meaning. For motion is a sort of activity, although incomplete, as we have said elsewhere.[1] Everything is affected and set in motion by an active agent and by something that exists in activity. There- 5 fore in one sense a thing is affected by like, in another by unlike, as we have said; for it is the unlike that is affected, but after being affected it is like.

We must, further, make a distinction touching potentiality and actuality, for we are now using these terms in a general sense. There is a sense in which we speak of 6 a thing as knowing, as when we call man knowing, because man belongs to the class of creatures that know and are endowed with knowledge. There is another sense in which we speak of a man as possessing the particular knowledge of grammar. In each of these cases a man 7 possesses knowledge potentially, but not in the same sense; the former is knowing as belonging to a certain genus and as having a native endowment; the latter is knowing in the sense of being able to exercise his knowledge at will, when nothing external prevents. In a still different sense there is the man who is actually exercising his knowledge, and is in a condition of complete realiza-

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[1] *Phys.* 201*b* 31, 257*b* 8.

tion, having in the strict sense knowledge of a particular
8 thing, as *e.g.* A. The first two know in a potential sense;
the one of them, however, knows when he is transformed
through a discipline of knowledge, and has passed re-
peatedly out of an opposite condition; the other knows
417 *b* in the sense of possessing arithmetical or grammatical
science;[1] and their passing from non-actual to actual
9 knowledge is different. Again, neither is the term 'pass-
ivity' used in an absolute meaning: in one meaning it is
destruction by an opposite principle; in another meaning,
it is the preservation of the potentially existent by means
of the actual and similar, just as potentiality is related to
actuality. That which possesses potential knowledge, for
instance, comes to the actual use of it—a transition that
we must either not call transformation (for the added
element belongs to its own nature and tends to its own
realization), or else we must call it a special kind of
transformation. It is, therefore, incorrect to speak of
thinking as a transformation when one thinks, just as the
builder is not transformed when he is building a house.
10 That which conduces to actualization out of a potential

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[1] These three forms of knowledge illustrate three stages in the passage from undefined potentiality (δύναμις) to complete and definite actuality (ἐνέργεια). From mere rational potentiality, in which one has no definite latent knowledge, one passes into a knowing state by repeated application to a given science, and so from a non-knowing condition into a knowing one. On the other hand, if one possesses a particular science, as grammar, one has definite latent knowledge and passes into active knowing, not by acquisition, but by applying what one possesses in a dormant or inactive state. As a specific potentiality it represents a higher stage in the progress towards actuality, which is this case is the active exercise of specific knowledge. The primary potentiality is a person teachable, the second a person taught, and the actuality is a person actively employing what is taught.

state in the matter of reasoning and thinking is not fairly called teaching, but must be given another name. Again, that which passes out of a potential state by learning or by acquiring knowledge at the hands of what actually knows and can teach, must either not be said to be affected as a passive subject, or we must admit two meanings of transformation, the one a change into a negative condition, and the other into a positive condition and the thing's natural state.[1]

The first change[2] in the sentient subject is wrought 11 by the generating parent, but after birth the creature comes into the possession of sense-perception as a species of knowledge. Active sensation is used in a way similar to active thinking. There is, however, this difference, that the objects which produce sensation are external, *e.g.* the visible and the audible, and similarly other sensible qualities. The reason for this is that active 12 sense-perception refers to particular things, while scientific knowledge refers to the universal. These universals, however, are, in a certain sense, in the mind itself. Therefore it is in one's power to think when one wills, but to experience sense-perception is not thus in one's power; for a sensible object must first be present. This also holds good of those sciences which deal with sensible realities, and for the same reason, viz. because these sensible

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[1] Διάθεσις signifies a transitional condition and ἕξις a permanent, natural state. The former is either mere potentiality or an imperfect stage in the passage of a thing towards its natural realization. As such it represents a condition of privation or negation (στερητική), compared with the positive, completed state at which a thing's nature aims.

[2] By 'first change' is here meant the native endowment with the potentiality to perceive and know.

13 realities belong to the world of particular and external phenomena.

To go into the details of these questions would be more suitable at another time. For the present so much may be regarded as fixed, viz. that the term 'potential' is not used in any absolute sense, but in one case its meaning is similar to our saying that a boy has in him the potentiality of a general, and in another case to our saying that a man in his prime has that potentiality—a distinction which also applies to the capacity for sense-
14 perception. Inasmuch as this distinction has no particular
418*a* name in our language, although we have remarked that the things are different and how they differ, we must simply employ the terms affection and transformation as applicable here. That which is capable of sense-perception is, as we have said, potentially what the sensible is actually. It is, therefore, affected at a moment when it is unlike, but when it has been affected it becomes like and is as its object.[1]

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[1] In other words, sensation represents an 'affection' or impression, and is the transformation of a potentially perceiving into an actually perceiving subject, in which case the sensible object is also converted or assimilated into a knowledge-form. In this sense it is made like the perceiving subject.

CHAPTER VI.

In discussing any form of sense-perception we must begin with the sensible object. The 'object of sense' is used in three meanings, two of which touch the essential nature of sensation and one its accidents. Of the two first-named, one applies specially to each particular sense, the other is common to them all. By
'peculiar object of sense' I mean a sense-quality which 2
cannot be apprehended by a sense different from that to which it belongs, and concerning which that sense cannot be deceived, *e.g.* colour is the peculiar object of vision, sound of hearing, flavour of taste. Touch,[1] however, discriminates several sense-qualities. The other particular senses, on the contrary, distinguish only their peculiar objects, and the senses are not deceived in the fact that a quality is colour or sound, although they may be deceived as to what or where the coloured or sonorous
object may be. Such qualities are called the peculiar 3
objects of particular senses, whereas common objects are

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[1] Touch distinguishes the properties of body as body (*De an.* 423*b* 27), more specifically the qualities hard and soft, moist and dry, hot and cold, smooth and rough. Moreover, taste is, according to Aristotle, a kind of haptic function.

motion, rest, number, form, magnitude. Properties of the latter kind are not the peculiar objects of any sense,
4 but are common to them all. Motion is apprehended by touch and by sight. A thing is an object of sense accidentally, *e.g.* when a white object proves to be the son of Diares. The latter is perceived accidentally, for the person whom one perceives is an accident of the white object. Therefore, the sense as such is not affected by the sensible object ([as a person]). To the objects of sense, strictly regarded, belong such properties as are peculiarly and properly sense-qualities, and it is with these that the essential nature of each sense is naturally concerned.

CHAPTER VII.

THE object of vision is the visible. The visible is colour
and something whose notion is expressible, but for which
there is no single definite name.[1] What I mean will be
best explained as we proceed. The visible, then, is colour,
and this is diffused upon that which is in itself visible,[2]
and by visible 'in itself,' I do not mean notionally
visible, but something which has in itself the cause of the
visible. All colour has the power to move the actually 418*b*
diaphanous and herein consists its nature. Therefore colour 2
is not visible without light, but every particular colour is
seen in the light. For this reason we must first explain
what light is. Light is something diaphanous. By diaphanous
I mean that which is visible, though not in itself and
absolutely, but only by means of an agent, namely colour.
Of such nature is air and water and many other bodies. 3
Water and air are not diaphanous as water and air, but
because there is in both these elements the same property
that is found in the eternal empyrean. The activity of

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[1] Such phosphorescent and scintillating substances as mushrooms, horn, fish-heads, etc. *Vid. De an.* 419*a* 5.

[2] Colour is not a substance but a property, a property diffused on the surface of a body and has the power to move a diaphanous medium. It is the coloured thing which is the substance or the *per se* visible.

y. For the same medium is sometimes dark and mes light. Not all objects are visible in the light ly the peculiar colour of each object. For certain [illegible] are not visible in the light but [illegible] sensa- the dark,[1] as *e.g.* those fiery, shining phenomena have no class-designation such as [illegible] horn, e heads, scales, and eyes of fish, while the peculiar of none of these objects is seen. The explanation of r visibility is subject for a different treatise than esent. So much is now clear: it is [illegible] that is in light. Therefore without light colour is not . For it is the essence of colour to set the ly diaphanous in motion, and the diaphanous in ity is light. Clear evidence of this is the fact that places a coloured object on the eye, it is not seen. ne contrary, it is the diaphanous as *e.g.* the air is stimulated by colour, and the sense organ is lated by this contiguous medium. Democritus g, then, in supposing that if the medium were a m our vision would be accurate, even to the seeing ant in the sky. This is impossible, for vision takes from the fact that the percipient organ undergoes fect, and this effect cannot be produced directly by visible colour. So that there remains only the sition that it is produced by a medium, and neces- ly there must be a medium. And were a vacuum ced, there would not only be no accurate vision but sion at all.[2]

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[1] phorescent substances.

[2] stotle says there are three things to be taken into account in sensa-tion—the organ, the object, and the medium, all of which are ones *sine quibus non.* The medium of vision is the diaphanous or

son why colour is visible only in the light has ained. Fire, however, is visible in both light ness, and necessarily so, for it is by the agency at the diaphanous becomes diaphanous. The ement applies also to sound and smell. For when placed in actual contact with the sense-duces the sensation of sound or smell, but by odour and sound a medium is set in motion and this the sense organ in each case is affected. ne should place a sonorous or odorous object on e organ itself, no sensation would be produced. ase of touch and taste, similar conditions hold hough not apparently. The reason for this evident later. The medium for sound is the re; the medium for smell has no name. It is nt that is common to air and water, and as anous is related to colour, so there is a some-water and air similarly related to an odorous for aquatic animals appear to be capable of the of smell. But man and the respiring land-smell only in so far as they employ inspiration. e of these phenomena will be explained later on.

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translucence found in air and water, a quality analogous to n the ether of the empyrean and in fire. The media of se 18, 420a 11) and smell are air and water, and the medium and taste) is the flesh. In this connection it is to be noted both air and water serve as media for smell, only air is a r man, and only water a medium for the aquatic animals e smell in water. Cf. De an. 421b 8, 15, 19; 422a 4; , 424a 17.

and whatever is hard and smooth do. Bronze is resonant because it is smooth. Hollow bodies, by reverberation, produce many reports after the first one, because the air, when it is once set in motion, can find no egress. Furthermore, audition takes place in air and water, but it is less perfect in the latter. But neither air nor water is the main thing in the case of sound. The percussion of solid bodies against each other and against the air must take place, and this takes place when the smitten air resists and is not dissipated. Therefore if it is struck quickly and vigorously it produces sound, for the motion of the striking agent must anticipate the dispersion of the air, as if one were to strike a pile or rapidly shifting heap of sand. An echo is produced when from the air which is made unitary by means of the vessel that confines it and keeps it from dispersion, an oncoming mass of air is driven back again like a rebounding ball.[1] An echo is apparently produced constantly, only it is not audible, for the same conditions hold good of both sound and light. Light is constantly reflected (otherwise light would not be found everywhere, but there would be darkness outside the region illuminated by the sun), but the reflection is not similar to that which is caused by water or bronze or any other polished solid, where a shadow is cast whereby the light-area is delimited. A 7 void is correctly regarded as a chief factor in hearing. Now, the air appears to be a void, and this, when it is moved as a single and continuous element, is what produces hearing. But, because of the swift dissipation of the air, no sound arises unless the object struck be smooth. In this case, however, the air by reason of 420 *a* the even surface, is made one throughout, for the surface of a smooth body is one throughout.

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[1] Sound, according to this explanation, is produced by smooth, resisting bodies. The production of sound depends on the following conditions: (1) an object to be struck, (2) a striking agent, (3) a communicating medium, (4) a hearing organ, (5) the delivery of the blow in such way that the diffluent air (medium) may not be dissipated and so prevented [illegible] sound. When the air is smitten quickly and vigorously, it is compressed before it can yield, and so emits a report, as the compressed air in a bladder makes a report on bursting (an illustration given by Wallace from Pacius). An echo is the repercussion of air from the resisting side of a vessel or place that obstructs the dissipation of air, whereby instead of becoming soundless it is thrown back, like a ball, and made to sound again. The disturbed air communicates with the air in the ear, which being fast immured cannot be dissipated, and interprets without variation the reports brought to it by the movements of the external air. Disturbances in the condition of the internal air, e.g. through yawning, modify the accuracy of hearing. We, also, for the same reason hear better when inhaling than when exhaling (De gen. anim. 781.).

A body is sonorous when it is capable of setting in motion up to the organ of hearing the single and continuous air. Hearing is naturally related to the air, and owing to the fact that sound is in the air, the inner air 8 is set in motion by the moving outside air. Therefore, an animal does not hear in all parts of its body, neither does the air penetrate everywhere. And the psychical organ that is to be stimulated does not contain air in all its parts. The air in and for itself is, by reason of its facile dispersion, non-sonorous. But when it is restrained from dispersion, its motion produces sound. The air 9 within the ears is so deeply immured as to be in itself immovable, in order that it may detect all distinctions in communicated motions. For these reasons we hear in water, because the water has no access to the congenital air, nor does it penetrate even into the ear because of the is found in all animals generally), whereas the communication of thought is given for the ends of higher living. So it is with respiration, which performs a function in reference to the internal warmth, and as such is necessary for living (the reason will be explained elsewhere), and another function in reference to speech, where it subserves the ends of higher living. The windpipe is the 17 organ of respiration, and this organ in turn subserves another, the lungs, and it is in virtue of the latter that land animals have more heat than others. The pericardiac region first of all needs respiration,[1] and, therefore, it is essential that the air be inspired inwards. And so it is the percussion of the inspired air, directed by the soul in those inward parts, against the windpipe, 18 as it is called, that constitutes voice. Not every sound of an animal is voice, as we have said (for it is possible to make noises with the tongue or such as people make in coughing), but the impact of the air must be animate and combined with some idea in order to be called voice. For voice is significant sound and not merely the sound of respired air, as is the case in coughing. On the contrary, the animal by means of this respired air pro- 421 *a* duces an impact of the air already in the windpipe against

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[1] The organs through which cooling is effected are the brain and lungs, and in the case of fishes the gills. The need of cooling is found in different degrees in different animals. Bloodless animals need it least. Insects do not inhale, but they are provided with a substitute for inspiration in a supply of congenital air. (*De respirat*. Ch. 9, 474*b* 25 ff.) The lungs of mammals contain most blood, while the lungs of birds and amphibious creatures are more spongy and contain most air, and the latter can consequently live longer without inspiring air. The air is carried through veins that lead from the lungs to the heart. *Hist. animal*. Bk. I. Ch. 17, 496*a* 27 ff.

the trachea itself. This is proven by the impossibility 19
of vocal utterance when we neither inhale nor exhale but simply hold our breath, because in holding the breath we thereby disturb this vocal process. Also, we see from this why it is that the fishes have no voice, being, as they are, without a windpipe. They lack this organ, because they are incapable of inhaling or exhaling air. The explanation of this is matter for a different treatise.

ment of individuals depends upon this sense touch and no other. Men who have hard flesh are poorly endowed intellectually, men who have soft flesh are gifted.

As one flavour is sweet and another bitter, so it is with smells. Although in some cases smell and flavour correspond to each other—I mean, for example, when we have a sweet smell and a sweet flavour—in other cases they are contraries. In like manner we refer the qualities of pungent, harsh, piquant and oily to smells as well as to flavours, but, as we have said, owing to the fact that smells are not so clearly discriminated as flavours, these terms are borrowed from taste on account of similarity in the sense objects. For the smell of saffron and honey is sweet, and the smell of thyme and similar herbs is pungent. The same holds good of other qualities. Further, just as hearing and each particular sense distinguishes its own object, in the one case the audible and inaudible, in another case the visible and invisible, so also smell distinguishes the odorous and inodorous. And the inodorous is so called in one case from the fact that it is totally incapable of yielding smell; in another case because the smell is faint or ndefinite. Similarly one employs the term insipid.

Smell is transmitted through a medium, such as air or water. For aquatic animals appear to smell; so, too, anguineous and bloodless animals, and the birds of he air, have this sense. Some of the latter are endowed ith the power of scent and mark their prey from afar. t seems doubtful, therefore, whether the process of smell 9 n all these animals is alike. Man smells while inhaling,

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[1] Compare our expressions 'thick-skinned,' 'hide-bound,' etc.

but without inhaling and while exhaling or holding his breath, he does not smell, whether the object be remote
10 or near, not even if it be placed in the nose itself. That an object when placed upon the sense-organ itself is not perceived, is a fact common to all the animals. But not to perceive odours without inhaling is peculiar to man, as may be proven by experiment. Were it not so, the bloodless animals, inasmuch as they have no respiration, would have to possess a sense beyond those already
11 named. But this is impossible, if it is true that they perceive smells, for the perception of the odorous, whether pleasant or unpleasant, is the sense of smell. Furthermore, as these animals appear to be destroyed by strong fumes, just as man *e.g.* is destroyed by pitch, sulphur, and similar fumes, they must have the sense of smell,
12 although they do not respire. The organ of smell in man appears to differ from that in the other animals, just as his eyes differ from those of the hard-eyed animals. For the eyes in man have a protection and, as it were, a sheath in the eyelids, and without moving or opening these he does not see. Whereas the hard-eyed animals have no such protection, but see at once whatever comes
13 into the field of vision. So also the organ of smell in
422 *a* some animals is uncovered, as the eye is; while in others that respire, it has a covering, which opens in inspiration
14 and by the dilation of veins and pores. For this reason the animals that breathe do not smell in water. For in order to smell they must inhale, and in water this is impossible. Smell is a property of the dry, as flavour is of the moist, and the organ of smell is potentially analogous to its object.

CHAPTER X.

THE sapid is a tactual property, and this explains the fact that it is not perceived through the medium of any foreign body.[1] For neither is the tactual so perceived. The body in which flavour, *i.e.* the gustable, is found consists in something moist as its matter, and this moist element is something tangible. Consequently, if we were in the water and something sweet were thrown into it, we should perceive it. The sensation, however, would not have been produced in us through a medium, but by the mingling of the sweet with the moist, as is the case 2 with a beverage. Colour, on the other hand, is not perceived by means of its being mingled with anything, nor by means of emanations. There is in the case of taste no medium; in other respects, however, as colour is to the visible, so is taste to the sapid. Nothing can stimulate the sensation of flavour apart from the moist, but an oist, without injury and without becoming intrinsically oist.[1] A proof is the fact that the tongue, when it is ery moist or very dry, is incapable of perceiving the sapid. or in this case there arises merely a tactual impression f the simple liquid, just as when one first tastes a strong lavour and then essays another, or as everything seems bitter to an invalid because his tongue is full of this bitter moisture. The varieties of flavours, as in the case of colours, are partly simple opposites such as sweet and bitter, partly the affiliated qualities oily and salty, and the intermediate qualities of pungent, harsh, astringent and acid. For these seem to include approximately all the distinctions in flavours.[2] So then the sapid sense is potentially of the same character as the sapid object which actually produces the sensation of taste.

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[1] The medium of touch is the flesh. The medium of taste is also the flesh, more particularly the tongue and throat (if Aristotle concurs in the popular opinion represented by Philoxenus, cf. *Eth. nicom.* iii. 10. 10. 1118*a* 33). These two senses, consequently, apprehend qualities only through immediate contact, while sight, hearing, and smell operate at a distance through the media of air and water.

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[1] Aristotle applies here to taste the metaphysical doctrine of potentiality and actuality which he employs everywhere in the explanation of organic life. All change is a transition from a potential state into a state in which a thing finds its end realized or in process of realization. So the sense of taste is only potentially taste until it is stimulated. In this process of actualization or realization the organ assimilates an objective quality and converts it into a subjective one, to use modern terminology, and this process Aristotle describes as the "sense becoming like the thing," or, specifically, the "capacity of the organ of taste to become moist, without being converted into moisture, or becoming intrinsically moist." The potentiality of the organ refers only to the ssimilation of a property or sense-quality.

[2] Aristotle distinguishes two fundamental colours, black and white which on surfaces correspond to darkness and light, and two fundaental tastes, bitter and sweet. Including black and white, there are ven primary colours, all of whose elements, however, are found in ck and white, and they are produced from these two by processes of xture. These colours are white, black (including grey, *De sensu*, 2a 22), yellow, red, violet, green, and blue. Analogously the seven mary tastes are based on bitter and sweet. The flavours are: sweet cluding the fat or oily), bitter, salt, harsh, pungent, astringent, acid *De sensu*, 4. 442a 12).

and taste would be regarded as one and the same sense. But as a matter of fact they are regarded as two, because they are not convertible.

9 Since body has depth, *i.e.* the third dimension, wherever there is an intermediate body between two other bodies the question might be raised whether it is possible for these two bodies to be in contact with each other. Now, neither the moist nor the fluid is incorporeal, but each must necessarily be water or contain water. But objects which are in contact with each other in the water, inasmuch as their extremities are not dry, must have water between them, in which their outer circumferences are
10 submerged. Now, if this is true, it is impossible for two objects in water to be in contact with each other. The same holds good of the air (for air is conditioned in the same way towards the objects in it as water is towards objects in water, only in the former case the conditions are more elusive for us ([who live in an atmospheric medium]),
11 just as aquatic animals fail to observe that the fluid is in
423 *b* immediate contact with the fluid. A further question then arises, whether the same process of sensation applies to all senses alike, or whether in different senses the process is different, just as touch or taste was seen to function by means of immediate contact, while the other senses function from a distance. This last distinction is not real, but both the hard and soft we perceive through media, as we do also the sonorous, the visible, and the odorous; in the one case we have objects at a distance, in the other, close
12 at hand. This is the reason why the medium eludes our observation. For we do sense everything through a medium, but in the case of things close at hand, the

existence of the medium escapes us. And yet, as we said above, were we to perceive all tangible qualities through the medium of a membrane without knowing that a medium intervened, we should then be in the same condition as we now are in the media of air and water. For we appear now to be in contact with things themselves, and not to apprehend them through a medium. 13 The tangible, however, differs from the visible and audible in that we perceive the latter by the medium producing a certain effect on us, while qualities of touch we do not perceive by means of the medium but simultaneously with it, as a man who is struck through his shield. For the struck shield does not strike him, but rather shield and man are simultaneously struck. In a word, flesh 14 and the tongue seem to be related to the sense-organ as air and water are severally related to sight, hearing, and smell. For were the sense-organ itself brought into contact with the object, sensation would not result either in the one case or the other, just as little as vision would result were one to lay a white object on the surface of the eye. By which it is evident that the organ of touch 15 must be internal,[1] for in this way it would be parallel with the other senses. When objects are placed upon the sense-organ, sensation does not result; on the other hand, when placed upon the flesh, sensation does result. Flesh must, therefore, be merely the medium of touch.

The distinctions of body as body are tactual. By dis- 16 tinctions I mean such as characterize the elements—viz. warm and cold, dry and moist, concerning which we have violently. Why is it, then, that plants have no sensation, having as they do a certain psychical endowment, and being affected by tangible qualities, for they experience 424 b *e.g.* cold and heat? The reason is that they have no mean in their nature, nor such a principle as is capable of receiving into itself the forms of sensible objects; on the contrary they are affected materially. One might raise the question whether a thing which cannot smell can be affected by odour, or that which cannot see can be affected by colour, and so on. Supposing that the object of smell is odour, odour produces the sensation of smell, if it produces anything at all: so that nothing which is incapable of smelling can be affected by odour. The same reasoning applies to the other senses. Neither can sentient beings be affected further than they are in each case sentient. This is also evident from the following: neither light nor darkness, sound nor smell, acts upon bodies, but the media in which these qualities exist may act upon bodies, *e.g.* it is the air which is combined with thunder that rives the tree. Tangible qualities, however, and flavours operate directly. If this were not so, how could inanimate bodies be affected and changed? Do the other qualities then act directly also? Or is it rather true that not every body is capable of being affected by smell and sound, and those which are so affected are indefinite and unstable, as *e.g.* the air? For air emits odour as if it were affected by something. What is smelling, then, beyond this being affected by something? Smelling surely means also perceiving, whereas the air by being affected is only made the ready object of perception.

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[1] The organ of taste and touch is the heart; the media, as already explained, are the tongue and flesh.

BOOK THE THIRD.

CHAPTER I.

THAT there is no additional sense beyond the five we
have enumerated (I mean sight, hearing, smell, taste, and
touch), one may believe from the following considerations.
Granted that we really have perception of everything for 2
which touch is the appropriate sense (for all the qualities
of the tangible as such are apprehended by touch), it is
necessary that if any sensation is lacking, some organ
must also be lacking in us. Whatever we perceive by
contact is perceived by the sense of touch, with which we
are endowed. On the other hand, whatever we perceive
through media and not by direct contact, is perceived by
simple elements, such as air and water. The conditions
here are such that if several sensible objects which differ 3
from each other generically are perceived by a single
medium, then anyone who has a sense-organ analogous
to this medium must be capable of perceiving these
several sense-objects. For example, if the sense-organ
is composed of air and the air is the medium of both
sound and colour, the organ would perceive both these
sense-qualities. If, on the other hand, several elements
are mediators of the same sense-qualities, as *e.g.* colour is 425 *a*

senses, *e.g.* common properties like motion, rest, form, magnitude, number, unity. For all these properties we perceive by means of motion. *e.g.* magnitude is perceived by motion. So also is form, for form is a sort of magnitude, and rest we perceive from the absence of 7 motion. We perceive numbers by the negation of continuity and by the special senses, for each sensation is experienced as a unit. So, then, it is clearly impossible that any particular sense should apply to these common properties, such as motion. For this would be like one now perceiving the sweet by means of sight. This is because we happen to have senses for both qualities ([*i.e.* for the sweet and for colour]), whereby when the given qualities coincide in one object, we recognize the object as sweet.[1] Otherwise we do not perceive the sweet, excepting in the sense of accident, as *e.g.* when we recognize the son of Cleon not because he is Cleon's son, but because he is a fair object, which for the son of Cleon is an accident.

We have indeed a 'common sense' for the perception of 9 common qualities. I do not mean accidentally. It is therefore not a particular sense, for in that case we should

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doctrine of Aristotle that 'common properties' are cognized by the 'sensus communis,' in its own nature, and by the individual senses only *per accidens* (*De an.* 425*a* 20, 25; 418*a* 9; 418*a* 24; *De sensu*, 437*a* 5). Biehl seems to have been influenced by the οὐ κατὰ συμβεβηκὸς of 425*a* 28 and its apparent contradiction of the present passage. There is, however, no contradiction, the οὐ κατὰ, κ.τ.λ. referring to the function of the 'common sense,' while the κατὰ συμβεβηκὸς refers to the function of the individual sense.

[1] We cognize the quality sweet by means of sight only *per accidens*. We *see* a sweet thing *e.g.* when we see a grape with a given colour and contour, knowing by experience that the colour and contour are associated with a quality sweet to the taste.

perceive in no other way than as just now described in the illustration of Cleon. A sense, however, percei accidentally the qualities that are peculiar to a differe sense, not in their own nature but because of t unity of these qualities, as when two sense-qualiti apply to the same object, *e.g.* in the case of bile that it both bitter and yellow. Now, it is not the function either particular sense to say that both these qualiti inhere in one thing and it is owing to this fact that err arises when in the case of a yellow substance one opine it to be bile. One might ask why we are endowed wit several senses and not with one only. Is it not tha facts of sequence and coincidence, such as motion, magn tude, and number, might the less escape us? For if w possessed sight only, and this were limited to the percep tion of whiteness, then all other distinctions would th more easily escape our knowledge, and because colo and magnitude are always coincident, they would appe to be identical. In point of fact, however, since the common qualities are found in different sense-objects, it evident that the several qualities themselves are differen

CHAPTER II.

But inasmuch as we perceive that we see and hear, we
must have this consciousness of vision either by the
instrument of sight or by some other faculty.[1] The
same faculty will then apply both to sight and to colour,
the object of sight. In this case, either we shall have two
senses for the same thing, or a sense will be conscious of
itself. Further, if there is another sense for the perception
of sight, either we shall have an infinite regressus, or
a given sense must finally be cognizant of itself, in
which case one would better admit this in the instance
of the original sense itself, *i.e.* sight. Here, however, is 2
a difficulty. For, if sensation by means of sight is vision,
and colour or that which possesses colour is what we see,
then the seeing faculty itself must first of all have colour
in order to be seen. It is plain, therefore, that sensation
by means of sight is not employed in a single meaning.
For even when we do not see, it is by means of sight
that we judge both of darkness and light, although not in
the same way. Furthermore, the seeing subject is in a

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[1] This function of consciousness is performed by the 'sensus communis.' Cf. Introduction, Chap. iv.

3 certain sense saturated with colour, since each sentient organ receives into itself the sensible object without its matter. This explains the fact that when objects of sense have been removed, the sensations and images still persist in the sense-organ.

4 The actualization of the object of sense and of the sense itself is one and the same process; they are not, however, identical with each other in their essential nature.[1] I mean, for instance, actual sound and actual hearing are not the same. For it is possible for one who has hearing not to hear, and for a sonorous body
5 not to emit sound at every instant. When, however, that which has the potentiality of hearing and that which has the potentiality of sounding, actually hear and actually emit sound, at that moment the realized hearing and the realized sound are simultaneously
426 *a* complete, and one would call them respectively the
6 sensation of hearing and the act of sounding. If, then, movement, activity, and passivity are implied in the produced object, it must be that actual sound and hearing exist in a potential state. For creative and motive activity is given in antecedent passivity.[2] It is, therefore, not necessary for the moving principle to be itself in actual motion. For as action and passion find their expression in the object acted upon and not in the producing agent, so too the actualization of the sensible object and the sense-organ is expressed
7 in the latter. The actualization of a sonorous body is sound or sounding; the actualization of the

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[1] The one is the condition of the other.

[2] That is, in a potential condition or a condition to be acted upon.

hearing organ is audition or hearing. For hearing is twofold and sound is twofold, and the same statement applies to other senses and sense-objects. In some instances the two have a distinct name, as *e.g.* hearing 8 and sounding; in other instances one of the two is nameless. For the actualization of sight is called seeing, but the actualization of colour has no name; the actualization of the organ of taste is called tasting, while the actualization of flavour is nameless. Inasmuch as 9 the actualization of the sense-object and the sense-organ is one and the same process, although the two things differ in their essential nature, it is necessary that hearing and sound, in this sense, should be both either destroyed together or preserved together; and the same applies to flavour and taste, and to the other sense-correlates. This necessity does not, however, apply to the sense-correlates in their potential signification. On the contrary, the old naturalists were wrong here, supposing, as they did, that neither white nor black has existence apart from sight, nor flavour apart from taste.[1] In one way they were right and in another wrong. For 10 owing to the fact that sense and sense-object have a twofold signification, namely that of potentiality and that of actuality, their dictum was applicable to the one meaning, but not to the other. They applied it, however, 11 to things absolutely which are not predicated absolutely.

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[1] By the old naturalists are probably meant Empedocles, Democritus, and the Protagoreans (Philoponus *Comment. ad* 426*a* 22. Ed. Berl. Ac. p. 475). Democritus distinguishes between the primary and secondary qualities of things, referring the latter (*e.g.* colour, flavour, etc.) to the perceiving agent, and the former (*e.g.* weight, density, etc.) to the object. Cf. Theophrastus, *De sensu*, 63.

If harmony is voice of a certain kind, and if voice and hearing are in a sense one and the same, and in another sense not one and the same, and if, further, 12 harmony is a relation of parts, hearing must likewise be a relation of parts. It is for this reason ([i.e. because sensation is a kind of proportion]) that every excessive stimulus, whether acute or grave, disturbs hearing. In like manner the sense of taste is disturbed by excessive 426 *b* flavours, the sense of sight by extremely glaring or extremely faint colours, smell by excessive odours, 13 whether cloying or acrid. Consequently, qualities are agreeable when, pure and unmixed, they are reduced to proportion, as *e.g.* the pungent, sweet, or saline, or in the domain of touch, the warm and cool. It is then that properties are pleasant. In general, the mixed, rather than the acute[1] or grave alone, is harmony. And sensation is proportion. Excessive stimuli either produce pain or pervert the organ.

14 Every sense is directed to its own peculiar sense-object; it is given in the sense-organ as such, and it distinguishes the different qualities in its appointed sense-object, as *e.g.* white and black in the case of sight, sweet and bitter in the case of taste. And the same can be said of other senses. Now inasmuch as we distinguish white, sweet, and every sense-quality by its relation to a particular sense, by what instrument do we 15 perceive that these qualities differ from one another? We must do so by means of sensation, for they are sense-qualities. Is it not plain that the flesh is not the final organ of sense? For the judging subject would then

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[1] Acute and grave are here used generically for extremes.

necessarily distinguish an object by contact. Neither is it possible by means of the distinct senses to judge that sweet is different from white, but it is necessary that both these qualities be cognized by some one faculty; otherwise it would be like my perceiving one thing and you another, and so proving that they are different. A 16
single faculty must, therefore, say that they are different. For the sweet is actually different from the white. One and the same faculty, then, must affirm this. And as this faculty affirms, so do thought and perception agree. It is clear that we cannot judge of distinct qualities by different senses, and we can conclude from this that we cannot judge of them at distinct intervals of time. For it is one and the same principle in us which says that 17
the good is different from the bad. Further, it says that they are different and distinct at the moment when this affirmation is made. And *when* is not used here in an accidental sense, by which I mean: *when* does not apply merely to the time of the affirmation, *e.g.* I *say now* that it is different, but it applies also to the thing affirmed, I say that it is *different now*, *i.e.* the time applies to the assertion and thing coincidentally. So the two elements 18
here are inseparable, and are given in an indivisible moment of time. It is impossible for the same thing or an indivisible entity to undergo opposite processes simultaneously and in an indivisible moment of time. For if sweetness stimulates sensation or thought in one way, then bitter stimulates it in an opposite way and white- 427 *a*
ness in some other way. Is, then, the judging principle[1] something at once numerically indivisible and inseparable, 19

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[1] The judging principle is the 'common sense.'

yet separable in the mode of its existence? There is a sense, then, in which as divisible it perceives the divisible, and a sense in which as indivisible it perceives the indivisible. For in its significant being it is divisible, but spatially and numerically it is indivisible. Or is this 20 not possible? Potentially, indeed, one and the same indivisible thing may contain opposite properties, but not in actuality; in its realized self it is separate, and it is impossible for a thing to be at the same moment both black and white. So that it is not possible for even the forms of experience to undergo these opposites, if sensation and thought be such forms.[1] Rather the case here is similar to what some call a point, which is divisible or 21 indivisible, as one regards it in its single or dual nature.[2] In so far as it is indivisible, the judging principle is one and coincident with perception; in so far as it is divisible, it is not one, for it employs twice and simultaneously the same mark. In so far as it employs a terminal mark as two, it distinguishes two things, and these are separable for it as a separable faculty.[3] In so far as it regards the point as one, it judges singly and coincidently with perception.

In this way, then, let us state our definition of the principle by virtue of which we say that animals are sentient beings.

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[1] By the law of contradiction. Cf. *Met.* 1063*b* 19; *Cat.* 12*b* 10.

[2] That is, as a single thing, or as the beginning of one line and the end of another.

[3] In so far as the mind looks at this single thing from two standpoints, as beginning and end, it acts in a way distinct from perception; in so far as it looks at it as a single object, apart from relations, it coincides with the act of perception.

CHAPTER III.

INASMUCH as the soul is defined mainly by means of two attributes, namely by locomotion on the one hand and by thought, judgment, and sensation on the other, it is supposed that thought and reflexion are a kind of sensation (for in both instances the soul discriminates and cognizes some reality), and even the old writers tell us that reflexion and sensation are identical, as *e.g.* Empedocles, who said: "Wisdom groweth in man in the face of a present object"; and in another verse: "Hence is given unto them the power of reflecting ever and anon on diverse things"; and the words of Homer have the 2
same meaning: "Such is the mind." For all of these ancient writers regard thought as something somatic, like sensation, and believe that both in sensation and thought like is apprehended by like, as we said in the beginning of this treatise.[1] They should at the same 3
time have spoken of error, for to animals this is more 427 *b*
natural than truth, and their souls pass most of their existence in error. According to this theory, as some 4
hold, either all phenomena must be true or else error

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[1] *De. an.* 404*b* 10 ff.

consists in the contact of the unlike, for this is the opinion that is opposed to the cognition of like by like. Further, in this case error and knowledge of opposites seem to be identical. That sensation and reflexion, therefore, are not identical is evident. For all animals 5 share in the one, but few only in the other. Neither is thought,[1] in which right and wrong are determined, *i.e.* right in the sense of practical judgment, scientific knowledge, and true opinion, and wrong in the sense of the opposite of these,—thought in this signification is not identical with sensation. For sensation when applied to its own peculiar objects is always true, and is inherent in all animals; but it is possible for discursive thought to be false, and it is found in no animal which is not also endowed with reason. Imagination, too, is different from sensation and discursive thought. At the same time, it is true that imagination is impossible without sensation, and conceptual thought, in turn, is impossible 6 without imagination. That thought and conception, however, are not one and the same is evident. For imagination is under our control, and can be stimulated when we wish (for it is possible to call up before our eyes an imaginary object, as one employs images in the art of mnemonics). Conception, on the other hand, is not 7 under our control. For it must be either false or true. Furthermore, when we conceive that something is terrible or fearful, we have at once a corresponding feeling, and the same may be said of what inspires courage. But in the case of imagination we are in the same condition as if we were to place a terrible or a courage-inspiring object before us in a picture. In conception itself there are distinct forms, such as knowledge, opinion, reflexion, and their opposites, concerning whose different meanings we shall speak later.

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[1] Νοεῖν is used here as genus, of which φρόνησις, ἐπιστήμη, and δόξα ἀληθής are species. Thought is called φρόνησις (*prudence*) when directed to a practical end, ἐπιστήμη (*scientific knowledge*) when it is theoretical and the conclusion is demonstrable, δόξα ἀληθής (*right opinion*) when the conclusion is not reached by scientific procedure or is not demonstrable and yet is true.

Since thinking differs from sense-perception, and in 8
one signification appears to be imagination and in another
signification conception, we must proceed to the treat-
ment of the latter, after we have defined imagination. 9
If imagination means the power whereby what we call a 428a
phantasm is awakened in us, and if our use of language
here is not merely metaphorical, then imagination is one
of those faculties or mental forces in us by virtue of which
we judge and are capable of truth and error. And these
faculties include sensation, opinion, scientific knowledge,
and reasoning. That imagination is not to be con-
founded with sense-perception is plain from the following 10
considerations. Sensation is either a mere power or a
distinct act, like sight and seeing, but imagination is
present when neither of these conditions is realized, viz.
in the phantasms of dreams. Again, sensation is always
present, but this is not true of imagination. If in reality
it were identical with sensation, then all animals would
have imagination. This does not seem to be the fact, as
we find in the case of the ant, the bee, and the worm.
Again, sensations are always true, while imaginations are 11
for the most part false. In the next place, we do not
say when we are accurately observing a sense-object, that

we imagine it to be a man. We say this rather when we
12 do not clearly perceive [and when the perception may
be true or false], and as we said above, we see imaginary
pictures even when our eyes are closed. But neither is
imagination one of those faculties whose deliverances are
always true, as *e.g.* scientific knowledge and reason.
For imagination can also be false. It remains to be
considered whether it is opinion, for opinion can be either
13 true or false. Opinion, however, is followed by belief (for
no man can have an opinion and not believe what he
opines), and none of the lower animals possesses belief,
although imagination is found in many of them. [Again,
every opinion is followed by belief, as belief is followed
by persuasion, and persuasion by reason. Now, some of
the lower animals have imagination, but none of them
14 have reason.] It is plain, then, that imagination is not
opinion combined with sensation, nor mediated by sensation,
nor a complex of opinion and sensation, and, for
the same reason, it is clear that opinion has for its
object nothing else than what sensation has for its object.
I mean *e.g.* that imagination is the complex of an opinion
of whiteness and a sensation of whiteness, and not the
complex of an opinion of goodness and a sensation of
428 *b* whiteness. To imagine, therefore, is to opine what,
15 strictly regarded, is a sense-object. Again, there are
false appearances when we have correct conceptions, as,
e.g. in the case of the sun which appears to be a foot in
diameter, whereas we believe it to be larger than the
inhabited earth. The consequence is that we must either
have thrown aside our true opinion which we held,
without the thing having changed and without any for-

getfulness or change of conviction on our part; or if one still holds it, it is necessary that the same opinion be both true and false. But an opinion has become false in a 16
case where an object, without our knowing it, has changed. Imagination, then, is not one of these faculties 17
nor a derivative of them.

Since one thing when moved can communicate motion to another, and since imagination is held to be a form of motion which does not come into existence without sense-perception, but only in sentient creatures or in reference to objects to which sensation applies, and since motion is produced by the action of sense-perception, and this motion must be equal to the strength of the sensation, one can affirm that the motion of imagination would never be possible without sensation nor could it take place in non-sentient creatures. Further, the one who experiences it can act and be acted upon in many ways, and one's experiences may be true or false. This 18
truth or falsehood is due to the following causes. Sense-perception is true when it concerns its own peculiar objects; at any rate, there is involved in this case, the least possible amount of error. In the second place, sense-perception may concern the accidental, and here error begins to be possible. One is not mistaken in saying that a thing is white, but if one says the white object is this or that particular thing, error arises. In the third place, 19
error applies to common properties and concomitants of the accidental, in which peculiar properties are involved. I mean *e.g.* motion and magnitude, which are accidental properties of sensible objects, and concerning which we are especially liable to error in sense-perception. The

motion set up by the activity of sensation will differ in
20 terms of the three following forms of sense-perception. The first movement is when the sense-perception continues present, and this is true; the other two may be false whether the object is present or withdrawn, but are especially liable to error when the sense-object is removed.

If imagination contains nothing but the elements
429*a* named and is what we have described it to be, it would be a movement stimulated by actualized sense-perception.
21 Since sight is our principal sense, imagination[1] has

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[1] The words *φαντασία* and *φάος* are derived from cognate roots (*φαν* and *φαF*) and *φαίνεσθαι* and *φαντασία* are etymologically akin. Aristotle's statement that the one is derived from the other is not strictly correct. It has been shown that imagination is not *αἴσθησις* (sensation), nor *νοῦς* (reason), nor *ἐπιστήμη* (scientific knowledge), nor *δόξα* (opinion). It originates, however, in the *sensus communis* and is a movement set up there by a past sensation. A sensation when past may leave an after-effect in the sense-organ which again, unless some greater or cross-stimulus inhibits it, may pass to the heart (the organ of the 'common sense') and there be revived as a pictorial image or phantasm, the real object being no longer present. This revival of a sense-image is imagination or phantasy (*φαντασία*), and the image thus reproduced is a phantasm (*φάντασμα*). Sensation, therefore, is a prerequisite of imagination, although the revival of the residual image of sense is emancipated from the action of the sense-organ itself. Aristotle distinguishes imagination from sensation: (1) imagination is a function of the internal or 'common sense' (*De mem.* 450*a* 10), sensation is a process of the external sense; (2) imagination may be active in sleep, when the senses are inactive, or when the eye is closed one may have visual imagination (428*a* 16); (3) sensations, as such, are true, while imaginations are in large part false; (4) sensation is possessed by all animals, imagination by certain ones only (428*a* 10). Again, imagination is distinct from reason (*νοῦς*) and scientific knowledge (*ἐπιστήμη*), for (1) both the latter proceed by necessary steps and are consequently true, while imagination is sometimes true and sometimes false (428*a* 18); (2) the steps in rational or scientific knowledge are not in our control, they follow from inherent necessity, while the pictures of imagination are arbitrary (427*b* 18). Further, imagination is distinct from opinion

derived its name from light, because sight is impossible without light. Because images persist and resemble sense-perceptions, animals regulate their actions to a large degree by imagination, some of them because they are incapable of reason, as the lower brutes, others because reason is sometimes veiled by passion, disease, or sleep, as is the case amongst men. Concerning imagination, what its nature is and what end it subserves, let the foregoing suffice.

(δόξα): (1) opinion is accompanied by belief, which is not true of imagination; (2) we may have a correct opinion about a thing, but our imagination about the same thing may be quite at variance with the opinion (428*b* 2). Further, it is not a combination of opinion and sensation as held by Plato (*Soph.* 264B, *σύμμιξις αἰσθήσεως καὶ δόξης*), because opinion and imagination may contradict, and consequently, in this case, must exclude, each other.

When the image is recognized as that of an object perceived in the past, with a consciousness of time, the imagination is then termed memory (*μνήμη*) and the image is *μνημόνευμα*. If the reproduction of the image is conscious and deliberate, the act is recollection (*ἀνάμνησις*). Inasmuch as the latter act requires reflection, only man is endowed with it, although memory is shared by the brutes (*De mem.* 453*a* 6 ff).

There is another form of imagination which one may call the generalizing imagination, and which Aristotle regards as the source of the images that accompany conceptual thought. He says there is no thought without an image (403*a* 8, 431*a* 16). As sensation is to the imagination, so is the imagination to thought (431*a* 14). Residual images are, therefore, the intermediary links between sensation or sense-perception and thought. Regarded as after-sensation, imagination is called *φαντασία αἰσθητική*; regarded as the prerequisite of thought, it is called *φαντασία λογιστική* (433*b* 29). Imagination is a weak or spent sensation (*αἴσθησις ἀσθενής*, *Rhet.* 1370*a* 28) or in Hobbes' language a "decayed sensation." Cf. Freudenthal, *Ueber den Begriff des Wortes φαντασία* p. 24.

The imagination in its reproductive function is the source of memory, recollection, and the association of ideas; in its productive or constructive function, it is the origin of fancies and distorted pictures in dreams, fever, and melancholia. Without it language would be impossible (420*b* 32), and it gives clearness to conceptual thought by clothing this in the schemata of sense (427*a* 16; 431*b* 4; 432*a* 9).

CHAPTER IV.

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REGARDING that part of the soul by virtue of which one
knows and reflects, whether it be a distinct part or
whether it be distinct only notionally and not really, we
have now to consider what its differential mark is, and by
what process thinking is exercised. If thinking is like
sense-perception, it would be either a kind of impression
made by the object of cognition or some analogous
2 process. It must, then, be impassive and yet receptive
of the form,[1] and in its nature potentially like to the
object of thought without being this object; and as the
sense-organ is related to the object of sense, in a similar
3 way thought must be related to the object of thought.
Reason must, therefore, be unmixed, as Anaxagoras says,
since it thinks everything, in order that it may rule, i.e.
in order that it may know.[2] It is the nature of thought

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[1] Sensation is described by Aristotle as the receptivity of the form or idea of a sensible thing without its matter (*De an.* ii. 12, 424a 18, δεκτικὸν τῶν αἰσθητῶν εἰδῶν ἄνευ τῆς ὕλης).

[2] This interpretation of Anaxagoras is regarded by Burnet (*Early Greek Philos.* p. 283 fr. 6 and 293, note) as unhistorical. He thinks the power of Nous to 'rule' means only the power to move and direct (κυβερνᾶν). Aristotle himself gives precisely Burnet's interpretation of the Anaxagorean Nous in *Phys.* 256b 25 (κινήσεως ἀρχήν; Plato,

to preclude and restrain the element that is foreign and adjacently seen. Its nature is therefore exclusively potentiality. What we call reason in the soul (by reason I mean the instrument by which the soul thinks and forms conceptions) is, prior to the exercise of thought, no reality at all. It is, therefore, wrong to suppose that reason itself is mixed with the body. For in that case it would have certain qualitative distinctions such as warm or cold, or it would be a sort of instrument like a sense-organ. But in point of fact it is nothing of the kind. Certain writers[1] have happily called the soul the place of ideas, only this description does not apply to the soul as a whole but merely to the power of thought, and it applies to ideas only in the sense of potentiality, and not of actuality[2]

Cratylus, 413c), and according to *De an.* [illegible] and [illegible] he would seem to have been unable to find any epistemological use for this Nous. The interpretation of Aristotle in the passage before us can, however, very well be a correct deduction from the principle of Anaxagoras, viz. that in order to rule and arrange all things aright the reason must also know all things, and it is not unlikely that Anaxagoras even made explicit mention of this: it is seemingly implied in the fragments. "Nous is the subtlest of all things and the purest [*i.e.* the least mixed], and it knows all and has all power" (fr. 123, Burnet p. 263). By virtue of its subtle nature and its being unmixed with the elements (I am not concerned here with the moot question of its incorporeality), the Nous is able to penetrate everywhere, and so has the most far-seeing knowledge as well as most wide-reaching power. Nous must then be unmixed and pure to be almighty and all-knowing, and consequently the commentary of Aristotle seems a legitimate construction to put upon Anaxagoras (cf. Zeller, *Phil. d. Gr.* Vol. I. 4th ed. p. 887; Trendelenburg, *De an.* 2nd ed. p. 385). In fact, it was precisely the element of knowing that was the important factor in the Anaxagorean Nous, as Orderer of the All.

[1] Plato and the Academy.

[2] Potentially, reason is that which becomes thought (there are no innate ideas); but the actual reason is identical with the actual thought, and in thinking its ideas the reason thinks itself (429*b* 9).

It is evident from the sense-organ and from the nature of sensation, that the term impassivity is employed in a 6 different meaning in sensation and in thinking. For sense-perception cannot take place when the sense-429 *b* stimulus is excessive, as one does not hear sound in the midst of loud noises, neither can one see nor smell in the midst of excessively bright colours and strong odours. On the other hand, when the mind thinks a very profound thought, it thinks not in a lesser but in a deeper degree minor details. For the power of sensation is not independent of the body, while the mind is separable. 7 When reason becomes its several objects in the sense in which an actually learned man is said to be learned (and this takes place when he can exercise knowledge through his own agency), even then reason is in a certain sense potential, although this potentiality differs from that which preceded learning and discovery. In the latter 8 case, potentiality signifies the capacity of thinking itself.

There is a difference between concrete magnitude and the ultimate nature of magnitude, between water and the ultimate nature of water (the same distinction can be applied to other instances, though not to all, for in some cases they are identical). Concrete flesh and the ultimate nature of flesh one judges either by a different and distinct faculty or by the same faculty under differing conditions. Flesh is not separate from 9 matter, but like a snub-nose, it is a particular thing in a given something. By means of a sense-organ one discriminates heat and cold and those qualities of which flesh is a sort of register. On the other hand, reason judges of the essential nature of flesh either by a

different and distinct faculty, or in the way in which
a bent line is related to itself when straightened.[1]
We refer the straight line as we do the snub-nose to
abstract entities,[2] for they are both associated with the
continuous. But the essential notion of a thing, if
straightness and the straight line are different (and they
are two things), is apprehended by a different power.
The mind, then, judges in the two cases by means of
a different power or by means of a power differently 10
conditioned. In a word, therefore, as there are things
abstracted from matter, so there are things that concern
the reason. If the mind is simple and impassive, and
has nothing in common with anything else, as Anax-
agoras[3] says, and if thinking means to be somehow 11

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[1] The bent line represents the concrete, distorted things of sense and the straight line the pure notion, and the two things correspond, apparently, to the distinction made above between τὸ σαρκὶ εἶναι and σάρξ, etc. Cf. Kirchmann and Wallace *ad loc.* Teichmüller's explanation (quoted by Wallace) of the bent line as representing reason, although ingenious, is not helpful here.

[2] These conceptions belong to mathematical notions and figures, and are abstract when contrasted with a material thing, but concrete when contrasted with the essential notion. Mathematical ideas (including 'snub-nose' as a figure) occupy a middle place in their degree of abstraction between the pure notion and a sense-object. The mathematical and the sense-object both belong to the continuous or the extended in space (μετὰ συνεχοῦς). Cf. *Phys.* 194*a* 10; *De an.* 431*b* 15. Mathematical entities are separable from matter only in logical conception. *Metaph.* 1026*a* 7 ff.; 1061*a* 28 ff.

[3] Anaxagoras gave no detailed account (as far as the fragments go) of the way in which we get our ideas of things, beyond the statement that the senses are too weak to discover the ultimate nature of reality, and that we know the existence of the ὁμοιομέρειαι (as his successors called the original homogeneous seeds or particles of things) only by processes of reason. This latter by its subtle and pure nature is capable of penetrating everywhere (*vid.* note 2, p. 112) and making the finest distinctions. In his theory of sensation Anaxagoras says we

impressed, one might ask, How will thought be possible? For it is only in so far as there is something common to two things that the one appears to act and the other to be acted upon. A further question might be raised, viz. whether the mind itself is the object of thought. If it is, mind will then either be found in other things, unless it is the object of thought in some way different from other objects, and unless the object of thought is a specific and single thing; else it will have a mixed composition which makes it like other
12 things, the object of thought. According to our former definition, 'to be affected in reference to a common element,' means that the mind is potentially the object of thought, though perhaps not actually so until thought takes place. It must be that the case here is similar to that
430*a* of the tablet on which nothing has been actually written. This is what takes place in the case of mind, and it is
13 the object of thought as other things are. Where entities are without matter, the subject and object of thought are identical. Speculative thought and the thing speculatively known are one and the same. The reason why thought is not continuous must be investigated. On the other hand, when entities are material they are severally the object of thought only potentially; mind is not an element in them (for reason is the potentiality of such objects in abstraction from their matter), whereas it is in the reason itself that the object of thought will be found.

do not apprehend like by like (Empedocles), but unlike by unlike, e.g. heat by cold, etc. Cf. Zeller *Phil. d. Gr.* Vol. I. 4th ed. p. 908.

CHAPTER V.

whole of nature there is on the one hand a al factor[1] for every kind of thing (and this is all things are in their potentiality), and another which is causative and productive of things, by of its making all objects, as art stands related to natter it employs. These distinctions must also good when applied to the soul. Reason is of such 2 cter that on the one hand it becomes all things, on the other creates all things, in this respect bling a property like light. For light in a certain converts potential into actual colours, and reason, in resent meaning, is separate, impassive, and unmixed, in its essential nature an energizing force. Now, is always higher than passion and causal force r than matter. Actual knowledge is identical 3 its object. Potential knowledge, on the other hand, xists in the individual; regarded absolutely it does not so pre-exist. For mind does not at one moment think and at another not. In its separated state alone reason is what it is, immortal and eternal. We have no memory of it, because this part of reason is impassive. The passive reason, on the other hand, is perishable. and without it there can be no thought.[2]

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[1] aterial factor' does not necessarily mean a thing constituted of atter, but refers to the metaphysical distinction between 'form' atter,' which in other terms are 'actuality' and 'potentiality.' meaning sensations as containing the potentiality of ideas are matter.'

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[2] *Vid.* Introduction, Chap. viii., and *The Classical Review*, Vol. VI. (1892), pp. 298 ff.

CHAPTER VI.

WHEN thought is applied to indivisible terms, error does
not arise. Where error and truth are both found is just
in the combination of thoughts into a sort of unity.
Empedocles[1] *e.g.* says; "Wherefore the heads of many
creatures sprang into life without necks," and later on
by the attraction of Friendship they were joined to-
gether. So, too, these disjoined ideas are combined 2
together by the reason, as *e.g.* the ideas of the incom-
mensurable and the diagonal. If the ideas refer to the
past or to the future, the element of time is added in 430*b*
the mind and combined with the ideas. Error is always
due to the combination. For even in the case where one
might think the white not to be white, one has made
the combination of the 'not-white.'[2] It is further
possible to apply disjunction to everything. It is not 3
only possible for the statement 'Cleon is fair' to be
true or false, but this may be applied to the past or to
the future. The unifying principle is in every case the

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[1] Burnet, *Early Greek Philosophy*, pp. 226, 229. Ritter and Preller *Hist. Phil. Gr.* p 140*a*.

[2] Omit ⟨*και*⟩ ⟨*λευκόν*⟩ which Biehl adopts from Cod. T and Röper's conjecture against the better reading of all the other Codd.

reason.[1] Since the simple or indivisible may be looked at from two standpoints, viz. either as potentiality or as actuality, there is nothing to prevent the mind from thinking the indivisible when it thinks of extension (which in its actual state is indivisible), and when it thinks it in an indivisible moment of time. For divisibility and indivisibility apply to time just as they 4 do to length. It is, therefore, impossible to say what the mind thinks in each half of a time-division. For the half does not exist, except in potentiality, if the division has not been made. But in the act of thinking each half separately, the mind divides the time also, and then the time corresponds in its division to the two lengths.[2] If, however, the mind thinks the object as a whole composed of two halves, it does this also with regard to time in its relation to the 5 two halves.

That which is not quantitatively but only notionally indivisible, the mind thinks in an indivisible time and by an indivisible power of the soul. It does this, however, accidentally and not in so far as the factors of thought and time are divisible, but in so far as they are indivisible. And there is also in these cases an objective factor which is indivisible, although perhaps not 6 a separate entity, that gives a unity to time and extension. And this is likewise true of everything that is continuous, whether in time or space. The point and everything obtained by division, and whatever (like a point) is no longer divisible, are explicable in terms of

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[1] The principle that combines or unifies terms into judgments.

[2] And the single length is then a unit and no longer a half.

privation.[1] Similar reasoning may be applied to other cases, as *e.g.* the way in which we know evil or black. For we know them somehow or other by means of their contraries. But the knowing mind must be these things potentially, and they must be reduced to unity in the mind itself. If, however, in the case of any causal 7
principle there is no opposite, then it knows itself, and is in actuality and is separate. A predication, as *e.g.* an affirmation, asserts something of something else, and is in every instance either true or false. This does not apply to the mind always, but when the mind asserts what a thing is in its essential nature and not what attaches to something as a predicate, then it is true. And just as sight is true when it concerns its own proper object, and on the other hand the opinion that a visible white object is or is not a man may not always be true, so it is with all immaterial entities.

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[1] As privation of extension.

6 as white and black. Let A, the objectively white, be
related to B, the objectively black, as the idea C is
related to the idea D, or it may be stated conversely.
Now, if the ideas CD attach to a certain thing, they will
be related to each other ([in the concept]) just as AB are
related to each other,—they will form one and the same
thing, though not identical in mode of being; and the
former combination (CD) is analogous to the latter
(AB)[1]. The same reasoning holds in case one were
431 b to apply A to a sweet object, and B to a white
7 object.

The reasoning mind thinks its ideas in the form of
images; and as the mind determines the objects it should
pursue or avoid in terms of these images, even in the
absence of sensation, so it is stimulated to action when
occupied with them. For example, when one sees that a
beacon is lighted, and observes by means of the 'common
sense' that it is in motion,[2] one comprehends that an
8 enemy is near. Sometimes by means of the images or
ideas in the soul the mind reasons as a seeing person,
and takes thought for the future in terms of things before
one's eyes. When the mind there in its world of images
says that a thing is pleasant or painful, here in the world
of things it pursues or avoids,—in a word, it acts.
Apart from action the true and false belong to the same
category as the good and bad. They differ, however, in

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[1] The illustration appears to mean that just as qualities are combined in a given thing and form an unitary object, so subjectively they form a single and unitary concept. They are identical in significance, though different in their mode of being.

[2] Motion is one of the κοινὰ αἰσθητὰ and as such is not discerned by any individual sense but only by the 'common sense.'

the absolute character of the one and the relative character of the other.[1]

The mind thinks abstractions, as *e.g.* when it thinks 9 the snub-nosed, which in one sense is a snub-nose, and in another sense, if one thinks it actually, one would think it as a curvature without the flesh in which the curvature 10 is found. So too with mathematical figures, though in actuality not separate from bodies, the mind thinks them as separated, when it thinks them. In a word the mind *is* the thing when actually thinking it.[2] Whether or not it is possible to think any abstraction when the mind itself is not separate from magnitude, must be investigated later.

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[1] The true and false are universally valid, regarded merely from the standpoint of cognition, but when regarded in the light of wrong and right they are relative to the individual. Or the passage may have another significance, viz. the notions of good and bad affect our wills and stimulate to action only when they are referred to particular objects. *Vid.* Kirchmann, p. 183.

[2] In the act of thinking, subject and object are identical; the thinking mind is the idea thought.

CHAPTER VIII.

LOOKING at the main features of what has been said of the soul, let us reiterate the statement that it is in a sense all reality. For everything, whether sensible or intelligible, is psychical; intelligible objects are in a sense knowledge, and sensible realities are sensations. How this is possible remains to be investigated. Con-
2 ceptual knowledge and sense-perception are each divided into two kinds, corresponding to their objects; potential knowledge corresponding to potential objects, and actual to actual. The sensitive and conceptual powers of the soul are, potentially regarded, the objective things, viz. the intelligible and the sensible. The soul, then, must be
3 either the things themselves or their form. It cannot, of course, be the things themselves. For a stone is not in the soul, but the form or idea of the stone. Consequently,
432a the soul is to be thought of as a hand; for a hand[1] is the instrument of all instruments, and the reason is the form of all forms and sensation in the form of all sensible
4 realities. Since, however, there is no object, as is supposed,

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[1] As the hand is the master instrument, so the soul is the master interpreter and reduces all things to a significant form.

apart from sensible magnitudes,[1] it follows that intelli-
gible objects,—I mean abstractions, as we call them, on the
one hand, and the qualities and conditions of the sensibles,
on the other,—must be sought in the sense-forms. For 5
this reason, also, it would be impossible for one to learn
anything or understand anything without sense-perception,
and when one contemplates a thing, one is forced to con-
template it in conjunction with an internal image. These
images are like sense-presentations, with the exception that
they are without matter. Imagination is different from 6
affirmation and negation; for the true and the false are the
combination of ideas into a judgment.[2] In what way are
the primary ideas[3] to be distinguished from imagination?
Or is it true that these[4] ideas are not themselves
images, yet they cannot be produced independently of
images?

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[1] The world of magnitudes and objects in space are mediated to the imagination by means of sense-presentations (*αἰσθήματα*), and to thought by means of sense-representations or images (*φαντάσματα*).

[2] Images (*φαντάσματα*) of the productive imagination, although they may correspond to no reality, yet are not, strictly speaking, either true or false. Truth and falsehood belong only to judgments or to an image when something is predicated of it.

[3] The primary ideas (*πρῶτα νοήματα*) refer to our highest abstractions. Although these notions are not *φαντάσματα*, their derivation is dependent on such images.

[4] Read *ταῦτα* (Torstrik) instead of *τἆλλα*.

CHAPTER IX.

SINCE the soul of living beings is defined in terms of two powers, viz. the power of judgment (which is the function of thought) and the power of sensation on the one hand, and the power of locomotion on the other, let the above suffice for our treatment of sensation and thought, and let us now consider the moving principle and ask what part of the soul it may be. The further question arises whether it is an individual part of the soul and separate, either concretely or notionally, or whether it is the entire soul. If it is only a part, we must ask whether it is a peculiar part and distinct from those usually described and already mentioned here, or whether it is
2 one of these. There is a difficulty at the start concerning the sense in which we are to employ the term
3 'parts' of the soul, and concerning their number. For in a certain way they seem to be innumerable, and not merely confined to those which certain writers distinguish, viz. reason, will, and desire,[1] and others classify as rational and irrational elements. For according to the differences by which they distinguish these parts,

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[1] Plato, *Republic* 441A (λογιστικόν, θυμοειδές, ἐπιθυμητικόν).

there seem to be other parts that are even more distinct
from each other than these, concerning which we have
just now spoken, viz. the nutritive part, which is found
even in plants as well as in all animals, and the sensitive
part, which one could not easily classify either as irrational
or as rational. Again, the power of imagination, which is 4
different in its mode of being from the others, appears to 432 *b*
be a distinct part, but in what particular it is identical with
or different from the others, is very difficult to say, if one
is to regard the parts of the soul as existing independently
of one another. In addition to these, there is
the desiderative part, which both notionally and functionally
might be supposed to differ from all the other
parts. And yet it would be absurd to sever this from 5
the others. For it is in the thinking element that
volition arises, and in the irrational element we have
desire and passion. But if the soul has three distinct
parts, then the desiderative element must be in all of
them. Moreover, the question again comes up which we 6
raised just now, viz. what is the principle in animals
that produces locomotion? One might suppose that it
is the generative and nutritive powers, found in all
living things, that produce the motion involved in growth
and decay common to them all. The subjects of inspiration
and expiration, sleeping and waking, must be
investigated later, for all of them present great difficulties.
But regarding locomotion, we must inquire what it is 7
that gives animals the power of progressive movement.
It is evidently not the nutritive power, for progressive
movement is always towards some end and accompanied
either by some image or desire. For where there is no

8 desire or revulsion, there is no motion, excepting where
external force is used. Further, if motion were due to
the nutritive power, plants would be capable of loco-
motion and would have some organic member adapted to
this motion. Soo, too, it cannot be the sensitive power
that is the source of motion; for there are many animals
which have sensation and yet, throughout their existence,
9 are stationary and motionless. If, then, nature creates
nothing in vain, neither does she omit anything that is
necessary, save in cases of deformed or imperfect beings.
And such animals as we have in mind are normal and not
deformed. A test of perfection is the capacity to
reproduce, to reach the prime of growth, and then decline.
Consequently, such animals should also have organs of
movement.[1]

10 But neither is the thinking power nor what we call
reason the cause of animal motion. For the contempla-
tive power does not think upon what is to be carried
into execution, neither has it anything to say touching
what is to be avoided or pursued, whereas motion always
belongs to that which pursues or avoids an object. On
11 the contrary, when one contemplates anything, the mind
does not bid one pursue or avoid; *e.g.* the fearful or
pleasant is often the subject of thought, but the feeling of
fear is not suggested; the heart, however, is agitated, or
if the feeling is pleasure, some other organ is stirred.
433*a* More than this, even when the reason commands and
intelligence tells us to avoid or to pursue a thing, motion

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[1] If locomotion were a function of the sensitive soul, these animals that are endowed with sensation, and are normal, would not be stationary, as some of them are (cf. note 1, p. 171), but would move.

does not follow, but one acts according to one's desire, like an intemperate man. We observe, in general, that 12 the man versed in medicine does not heal, because it is something other than science that has the power of acting according to the principles of science.[1] Neither, again, is desire the dominating principle[2] in this motion; for continent men, though filled with desire and appetite, do not do the things for which they lust; on the contrary, they follow reason.

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[1] It is not science, but nature, the principles and laws of whose operation are formulated by science, that heals.

[2] Neither desire nor reason taken alone is the principle of action in men, but the combination of these two. Cf. 433*a* 23.

CHAPTER X.

THERE are two powers in the soul which appear to be
moving forces—desire and reason, if one classifies imagina-
tion as a kind of reason. For many creatures follow
their imaginations contrary to rational knowledge, and in
animals other than man it is not thought nor rational
procedure that determines action, but imagination. Conse-
2 quently, both of these, reason and desire, can produce
locomotion—I mean here the reason that considers ends
and is concerned with conduct.[1] It differs from the
theoretical reason in having a moral end. Every desire
3 aims at something. It is the final end that is the initial
cause in conduct.[2] So that it is reasonable to regard
these two principles, viz. desire and practical reason, as
motor forces. For the object of desire stimulates us, and
through it reason stimulates us, because the object of
desire is the main thing in the practical reason. Imagina-
tion, too, when it stimulates us to action, does not do so
independently of desire. The one single moving force is

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[1] This is the epitactic reason (φρόνησις ἐπιτακτική) of the Ethics (*Eth. nic.* vi. 10, 2). The theoretical reason deals with necessary truth. while the practical or epitactic reason deals with the contingent or what is matter of choice.

[2] The end of action is motive or starting-point.

the object of desire. For even if there were two moving powers, reason and desire, still they would produce movement in accordance with some common idea. As a 4 matter of fact, however, reason does not appear to produce movement independently of desire. For volition is a form of desire, and when one is prompted to action in accordance with reason, the action follows also in accordance with volition. But desire prompts actions in violation of reason. For appetite is a sort of desire. Reason, then, is in every case right, but desire and imagination may be right or wrong. It is, therefore, always the object of 5 desire that excites action, and this is either the good or the apparent good—yet not every good, but only the good in conduct, and this practical good admits of variation.

Evidently the psychical power which excites to action has the nature of desire, as we call it. In analysing 6 the elements of the soul, if one analyses and distinguishes 433 *b* them in terms of powers, they become very numerous, as *e.g.* the nutritive, sensitive, rational, deliberative, and desiderative. For these differ from each other more than do the desiderative and spirited elements. Although desires arise which are opposed to each other, as is the 7 case when reason and appetite are opposed, it happens only in creatures endowed with a sense of time. (For reason, on account of the future, bids us resist, while desire regards the present; the momentarily pleasant appears to it as the absolutely pleasant and the absolutely good, because it does not see the future). The moving principle, which is the desiderative faculty as such, is specifically one, though numerically several motive forces

may be included in it. The main element here is the object of desire (for this by being the object of thought or imagination excites movement, while it is itself unmoved).
8 There are, then, three terms to consider here, first the motor power, secondly the instrument of motion, and thirdly the object set in motion. The motor power is twofold: on the one hand, it is an unmoved element, and on the other, a moving and moved element. The unmoved element is the good to be done; the moving and moved element is the desiderative faculty (for the desiderative faculty in so far as it desires is moved, and desire in process of realization is a form of motion); the object which is set in motion is the animal. The instrument by which desire effects motion, is of course the body, and consequently it must be investigated where we have to
9 do with functions which are common to the body and the soul.[1] One may, however, say summarily here that motion is organic in those cases where beginning and end are one, as *e.g.* in a joint. For here the convex and concave are beginning and end. Therefore the one is at rest and the other in motion, and while they are notionally distinct, they are concretely inseparable. Everything
10 is set in motion by push or pull, and there must be consequently, a fixed point, as the centre in a circle, and this is the initial point of motion.[2] In a word, then, as we said before, an animal in so far as it is capable of

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[1] The reference is probably to the *Parva Naturalia*. Cf. Zeller, *Aristotle*, Eng. tr. vol. i. p. 89; Freudenthal in *Rhein. Museum*, N.F., Bd. 24 (1869), p. 82; Rose *De Aristot. librorum ord. et auct.* p. 163.

[2] As in the illustration of the socket-joint and the circle, there is a part at rest from which motion proceeds and a part in motion.

desire is capable of self-movement. Desire, however, is not found apart from imagination, and all imagination is either rational or sensitive in origin, and the lower animals share in it.

Analogously, the reason is not itself in movement but is that from which movement proceeds. The attractive thing on the one hand, and the commanding reason or desiring mind on the other, constitute the push and pull in animal life.

CHAPTER XI.

WE must inquire also into the nature of the moving principle in those imperfect animals which possess only
434*a* the sense of touch. Is it possible for them to have imagination or desire? They appear to feel pleasure and pain, and if these are felt they must necessarily have desire also. But how could they have imagination? Or are we to say that just as their movements are indefinite,
2 so too this power is possessed by them, only it is indefinitely developed. Imagination derived from sensation is, as we said before, found in the lower animals, but deliberative imagination is found only in those animals which are endowed with reason. For whether one shall do this or that is, of course, a matter of deliberation, and there must be some single instrument of measurement at hand (for it is the greater good that is to be pursued), and
3 so the mind is able to make a single representation out of several images. The ground for supposing that animals do not have opinion is that they do not have the faculty for drawing rational conclusions, and opinion involves this. Consequently, their desire lacks the deliberative quality. Sometimes the desire overpowers

the deliberative element in man and excites to action. At other times the will overpowers the desire, and again, like a ball tossed to and fro, one desire overpowers another, as in the case of intemperance. In the workings of nature the higher element always has the greater authority and is the moving power. There are, then, three forms of movement.[1] The faculty of conceptual 4 thought is not moved, but remains at rest. Since we have two principles in conduct, on the one hand the general conception[2] and notion, and on the other hand the particular notion (of which the one says a man of such and such a kind shall act in such a way, and the other that this particular man—and I am that particular man—shall act in a given way), it is the latter notion that incites to action, but the general one does not. Or both of them combined may lead to action, although the general notion is quiescent, and the particular one active.

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[1] There is (1) the command issuing from the unmoved reason, which acts on desire in a manner analogous to motion in the form of 'push'; (2) when an object stirs the desire and through the desire the reason is awakened, the case is then analogous to motion in the form of 'attraction' or 'pull'; (3) the completed process terminates in an act of bodily or physical movement.

[2] Cf. *Eth. nic.* vii. 3, 6, 1147*a* 1-10.

CHAPTER XII.

EVERY living thing must have a nutritive soul in order that it may live and continue to live from birth until death. What has been born must grow, reach its complete development and decline, and this is impossible without food. A nutritive power must, therefore, be given to everything that grows and dies; but sensation
2 is not necessary to all living things.[1] Whatever has a simple body cannot be endowed with the sense of touch (neither is animal life possible without touch), and whatever is incapable of interpreting the forms of things without their matter is also incapable of touch. An animal must have sensation, if it is true that nature creates nothing in vain. For everything in the natural world exists for a purpose, or is the condition of some-
3 thing that exists for a purpose. If, then, a body which is endowed with the power of movement were deprived of sensation, it would perish and would not attain the
434 *b* end for which nature strives. For how will it nourish itself? Amongst organisms fixed to one spot, a source of food is provided for them from which they naturally

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[1] Vegetable life exists only in the lowest or nutritive form.

grow. It is, however, impossible for a body that is not stationary, and is produced by generation, to have life and a thinking mind, and yet not have sensation. No more is this possible in bodies that are not produced by generation.[1] For to what end will they lack sensation? 4
It must be because such lack will be better either for their soul or body. But neither is true. For the one will thereby think none the better, nor the other last any the longer. Consequently, no moving body has a soul that is unendowed with sensation. If, however, the body is endowed with sensation, it must be either single or mixed. The former is impossible; for in that case[2] 5
it could not have touch, and touch is necessary. That is clear from the following grounds. Since every living creature is an animated body, and every body is tangible, and tangible is that which is sensed by means of touch, it follows necessarily that the animal body must be capable of the sensation of touch, if the animal is to 6
persist in life. The other senses, such as smell, sight, and hearing, perceive through other media than the tangible body. If, however, an animal on being touched were to experience no sensation, it would have no power to avoid certain things and pursue others. And if this were the case, the animal could not survive. Therefore, taste is a kind of touch, for it is concerned with food, and food is a tangible body. Sound, colour, and smell, on 7
the other hand, furnish no nutriment and do not contribute to growth and decay. Consequently, taste must

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[1] Even the eternal and unbegotten bodies (stars) have the power of sensation. Cf. *De Coelo*, 285*a* 29, 292*b* 2.

[2] Touch implies the duality of perceiving soul and tangible body.

be a sort of touch, because it is a sense that concerns a tangible and nutritive object. Both of these senses ([touch and taste]) are necessary to every animal, and it is evident that no animal can exist without touch. The
8 other senses exist for the sake of higher well-being[1] and are not found indiscriminately in animal species, but only in certain of them, viz. in such as are capable of progressive motion, and here they are necessary. For if such an animal is to survive it must not only apprehend an object by touching it, but must be able to do this at a distance. This result would be attained if the animal were capable of sensation through a medium, and the medium were impressed and set in motion by
9 the sensible object, and if the sense-organ were in turn stimulated by the medium. Just as a body moving in space causes a transfer of energy up to a certain point, and the propelling body causes another body to become propulsive, and through the mediate term motion is continued; and as the initial agent moves and exerts propulsion without being itself propelled, while the last body in the series suffers propulsion without exerting it and the intermediate bodies (of which there may be many),
435a both suffer and exert it; so it is also with the process of change ([in sensation]), excepting that here change may take place while the object continues on a single spot. For example, when one dips an object in wax, movement of the wax takes place up to the point that immersion has taken place. A stone, however, would not be moved

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[1] Certain creatures are endowed merely with fitness for life, while the endowment of others fits them for aesthetic and moral life (καλοῦ ἕνεκα ζῆν), *Eth. nic.* 1143*a* 15, 1170*a* 16, 1180*a* 10; τοῦ εὖ ἕνεκα, *De an.* 435*b* 21; *De sensu* 437*a* 1.

in this way at all, while water would be moved more 10 than wax. The most mobile element, both in its power to receive and communicate motion, is the air, provided it is confined and is a unit. Concerning the phenomenon of the reflection of light, then, it is better to suppose that the air, in so far as it is a continuous mass (and this is the case upon every smooth surface), becomes charged with form and colour, rather than that the visual image after it has once issued from the eye is reflected back to the eye.[1] Consequently, the air reacting on the eye stimulates it, as if the impress in the wax were to penetrate through to its opposite extremity.[2]

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[1] The reference is to Empedocles, who believed there was a dual efflux or emanation from the eye and from the object (cf. Platos *Menon* 76 c ff., Aristot. *De sensu* 438*a* 1 ff.) and to Plato (*Timaeus*, 45 c).

[2] That is, the visual image is supposed to penetrate through the mass of air, as it were, to the opposite side and so pass into the seeing organ, just as one might conceive the seal with its impress piercing entirely through the mass of wax into something capable of receiving it on the remote side.

CHAPTER XIII.

EVIDENTLY an animal body cannot be simple. I mean that it cannot *e.g.* consist simply of the element of fire or air. For without touch one cannot have any other sensation. Every body endowed with soul has the capacity of touch, as we have already said. All the other elements, excepting earth, might become organs of sensation, but all of them produce sensation by the
2 instrument of intermediary bodies. Touch, on the contrary, appears to act by immediate contact with bodies, and hence its name, and although the other sense-organs effect sensation by means of contact, yet the contact is indirect and mediated; whereas touch is the only sense that acts by direct contact. So then no animal body can be constituted exclusively out of such elements ([as are fitted for mediate perception]), neither can it be
3 constituted exclusively out of earth. For touch is, as it were, the mediator of all tangible things, and the sense-organ is capable of receiving not only all the various qualities that attach to earth, but also the hot and cold and all other tactual distinctions. Therefore we have no sensation in our bones, hair, and other such parts,

because they are constituted out of the element of earth. For this reason also plants have no sensation, because 435 *b* they are composed of earth. Without touch there can 4 be no other sensation, but the organ of touch is not composed exclusively of earth nor of any other single element. It is plain, then, that this is the only sense, the deprivation of which necessitates the death of animals. For neither is it possible for anything that is not an animal to have this sense, nor is it necessary for anything that is an animal to have any sense beyond 5 it. Therefore, other sense-qualities, such as colour, sound, and smell, do not by their excess destroy an animal; they only destroy the sense-organ, except in some accidental case, as where a push or blow accompanies the sound, and when other objects are set in motion by sights and smells which, by their contact, work destruction.[1] Flavour, in so far as it is conjoined with a 6 tactual nature,[2] works destruction by virtue of this latter. But excess in tangible qualities such as heat, cold, or hardness, destroys the animal. For the excess of every sensible quality destroys the sense-organ, so that the tangible destroys the tactual sense, and it is in terms of this that life is defined. For it has been demonstrated that without the sense of touch a living creature is an impossibility. Consequently, excess of 7 tangible impressions not only destroys the sense-organ, but also the animal itself, because this sense is the sole requisite to animal life. An animal possesses the other senses, as we have said,[1] not for the sake of life but of a higher life. It has sight, *e.g.* in order that it may see, since it lives in a medium of water, or air, or, in a word, in a diaphanous medium, and it has taste, because of the distinctions of pleasant and unpleasant, and in order that it may detect these qualities in its food and so desire it and be moved to obtain it. It possesses hearing in order that information may be communicated to it, and a tongue in order that it may communicate information to others.

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[1] Simplicius (*ad loc.*) thinks that lightning is meant here.

[2] Aristotle would appear to refer death by poison to its tactual qualities.

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[1] Cf. *De an.* 434*b* 24.

(PARVA NATURALIA.)

ON SENSATION AND THE SENSIBLE.[1]

CHAPTER I.

436*a* Now that we have treated of the soul in its essential nature and of the faculties that belong to it, part by part, our next duty is to investigate the subject of living creatures and everything that has life, to determine what

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[1] The following opuscules of mixed physiological and psychological content are never cited by Aristotle under a general title, but always referred to separately. They were given the title *Parva Naturalia* by the scholastics, but even the learned Leonicus apparently does not know by whom (*Comment. in Parva Natur.* fol. 1530, p. 11), and Simon is only able to say "*denominatio a Latinis inventa est*" (*Comm. in libr. de sensu*, 1566, p. 1). The designation is used by Egidio Colonna (cf. *Rhein. Museum*, vol. 24, 1869, p. 81), who was a pupil of Thomas Aquinas, and we may assume that the title came into existence about the time of Thomas, when great interest was taken in the interpretation of the Aristotelian writings, although Freudenthal was unable to find it either in Albertus Magnus or in Thomas. The tractates discuss, in the main, the organic functions of animal bodies, and form at once a continuation and supplement to the *De anima* and an introduction to the treatise *On the Parts of Animals*. They form thus a transition from Psychology to Zoology. In content they are mainly biological and physiological, concerned chiefly with the physiology of the senses. They supplement the *De anima* in the following particulars: In the *De anima* the soul is regarded as the principle of organic life, which is manifested in the forms of cognition and physical vitality. The detailed consideration of the relation between these two things is left for the *Parva Naturalia*;

functions are specific[1] and what functions are general. Let us then take what has already been said touching the soul for our basis, and as we proceed to the remaining inquiries let what is first by nature[2] be first in our dis-
2 cussion. The most important vital phenomena, whether one regards the specific or general attributes of animals, are those which are the joint concern of soul and body,[3] such as sensation, memory,[4] anger, desire, and impulse in general, and, one may add, pleasure and pain. These are
3 experienced by almost all animals. In addition to these, however, there are other attributes which are common to all animals that share in life, and others still that belong only to certain animals. The most important of the former class may be enumerated in four pairs, viz., sleeping and waking, youth and old age, inspiration and expiration, life[5] and death. We must study the nature

further, the nature of memory, the association of ideas, and the subject of dreams, are treated almost exclusively in the opuscules. The brief accounts of 'common sense,' pleasure and pain, and motion in the *De anima* are supplemented here. Further, such biological considerations as the conditions, disturbances, and duration of organic life were scarcely noticed in the *De anima*, but receive detailed treatment in the tractates *On Youth and Old Age*, *Life and Death*, and *On Respiration*.

[1] Reason and Recollection *e.g.* are specific functions, while nutrition and growth are general and common to all living organisms.

[2] By this is meant the elemental functions connected with the life of the body (*κοινὰ τῆς ψυχῆς καὶ τοῦ σώματος ἔργα*), on which depend nutrition and reproduction, sleeping and waking, etc.

[3] *De an.* 433*b* 19, 20.

[4] Memory (*μνήμη*) but not recollection (*ἀνάμνησις*), which involves reflection, and is peculiar to man.

[5] To these four pairs of biological phenomena is added a fifth below—health and disease. Youth and old age, life and death are treated in one opuscule, sleeping and waking in another, inspiration and expiration in another, while the subject of health and disease was either not treated at all, or the treatise has been lost. No such treatise was known to Alexander Aphrodisiensis (*Comment. ad* 436*a* 17).

of each of these phenomena and the causes of its occurrence. The investigation, too, of the ultimate principles of health and disease is the province of the naturalist; for 4
neither health nor disease can apply to creatures when deprived of life. And so it happens, as I think, that most natural philosophers and those physicians who have a more philosophical understanding of their science, conclude in the one case with the investigation of medicine, and in the other begin their practice with deductions 436 *b*
from the laws of nature and their application to medicine.[1] The above-mentioned phenomena are evidently 5
the common property of soul and body. For they are all conjoined with sensation or are mediated by it. Some of them are modifications of sensation or persistent conditions of it, others are protective or preservative of sensation, while others still are destructive and negative. That sensation is mediated by the body to the soul is plain both with and without the use of rational proof. However, regarding the essential nature of sense-perception and the reason why animals are endowed with it, we have 6
already stated our views in the treatise *On the Soul*.[2] Every animal, in so far as it is a living creature, must have sensation. For it is in terms of this that we distinguish between animal and non-animal. Touch and 7
taste must belong to all animals individually, touch for reasons given in the treatise *On the Soul*,[2] and taste on account of food. For it is by taste that animals

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[1] Cf. 480*b* 25, where the tractate on Respiration closes with an almost verbatim repetition of this statement.

[2] In the *De an.* the purpose of sensation is described as two-fold, (1) the survival of the animal, (2) the ends of higher living (cf. 420*b* 20 ff., 434*b* 22 ff.).

discriminate between agreeable and disagreeable in foods, and so reject the one and take the other; in a word flavour[1] is an affection that belongs to the nutritive 8 soul. Sensations that are excited by external objects, such as smell, hearing, and vision, are found in animals capable of locomotion, and are given to all of them for the sake of their preservation, in order that they may scent their food and pursue it, and flee from what is harmful and destructive. In the case of animals endowed 437 a with intelligence, they are given for the sake of higher well-being. For these sense-perceptions convey to us various distinctions, out of which the knowledge of intel- 9 lectual and moral concepts is built up. Amongst the senses, vision is the most important, both in itself and for the necessities of life; on the other hand, for the uses of reason, and accidentally, hearing is the most important.[2] 10 The power of vision informs us of many and various distinctions, because all bodies are suffused with colour, so that by means of this sense more than by any other we perceive the common properties of objects (by common properties I mean form, magnitude, motion, number). Hearing, on the other hand, informs us merely of distinctions in sound, and in some instances of distinctions in

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[1] That is, flavour as a property of food affects the process of growth or the nutritive soul. Touch is the lowest or most fundamental sense, and taste is a form of touch mediated by the tongue. These two serve the primary or lowest ends of life. Sight and hearing serve the higher or more intellectual needs.

[2] Although sight conveys to us the greatest number of impressions touching the outside world, Aristotle considers hearing the most important of the senses intellectually, because it mediates oral instruction. This is called *per accidens*, because *per se* the hearing mediates only sound, and it is accidental to the function of hearing that this sound should be significant or have meaning.

articulate voice. Indirectly, however, hearing contributes 11
the greatest share to our intellectual life. For it is the
spoken and heard word that is the source of knowledge,
and hearing is the source not in itself but accidentally.
Language is composed of words, and every word is a
symbol. This explains the fact that in cases where men 12
are deprived of one or the other of these senses from
birth, the blind are more intelligent than the deaf and
dumb.[1]

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[1] This is no doubt correct, owing to the advantage the blind have over the deaf and dumb in the use of language. This advantage has been greatly modified, of course, by the development of linguistic instruction for the deaf and dumb. The necessity of language for thought is a still unsettled question. Cf. James, *Principles of Psychology*, Vol. I. p. 269, who considers language, in its ordinary meaning, unnecessary for thought. Sully (*The Human Mind*, Vol. I. p. 420), on the other hand, says: "It seems safe, therefore, to conclude that apart from verbal or other general signs the full consciousness of generality does not arise." Romanes (*Mental Evolution in Man*, p. 149): "These unfortunate children [*i.e.* the deaf and dumb who are never taught finger-language] grow up in a state of intellectual isolation, which is almost as complete as that of any of the lower animals."

CHAPTER II.

We have already treated of the function of the several
special senses. Writers now-a-days attempt to correlate
the senses with the physical elements[1] as found in the
bodily members in which the sense-organs have their
natural development. With the fifth sense they are
hard pressed, not finding it easy to pair five senses with
2 four elements. All of them agree in regarding vision as
connected with fire, on account of a certain phenomenon
whose nature they misunderstand: viz. when the eye is
pressed and moved it seems to scintillate.[2] But this
takes place in the dark or when the eyelids are shut, in
which case darkness is produced. And there is also
3 another difficulty here. For if it is impossible for a
perceiving and seeing subject to be unconscious of a seen
object, then the eye must necessarily see itself. Why,
then, does this not take place when the eye is at rest?
The explanation of this phenomenon, as well as the
solution of the entire difficulty and of the apparent fact
that vision is fire, is to be found in the following con-

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[1] Empedocles, Alcmaeon, Democritus, Plato.

[2] Pressure on the optic nerve, of which Aristotle knew nothing, stimulates the sensation of light.

siderations. It is the nature of smooth surfaces to shine 4 in the darkness, although they produce no light; now we observe that the dark central portion of the eye has a 437 *b* smooth surface. This becomes apparent when the eye is moved, because the single organ is thereby made double, an effect which is produced by the rapidity of the motion. In this way the seeing organ and the seen object appear 5 to be different.[1] For the same reason, also, this effect fails to be produced, when the motion is not rapid and does not take place in the dark.[2] For it is in a medium of darkness that a smooth surface naturally shines, as we see in the case of the heads of certain fishes[3] and in the juice of the cuttle-fish. The consequence is that when the eye is moved slowly, the seeing organ and seen object do not appear to be at once unitary and dual. When, on 6 the other hand, the movement is rapid the eye sees itself, as in the reflection of a mirror. Now, if vision were fire, as Empedocles declares and as we read in the *Timaeus*,[4] and if seeing resulted from the passage of light out of the eye as from a lamp, the question arises: Why is it that 7 we do not see in the dark also? To say, as the *Timaeus*[5] does, that the light when it passes out from the eye is extinguished in the darkness, is a totally empty assertion. For what is meant by an extinction of light? The warm and the dry, it is true, are nullified by the moist and the cold, as one sees in the case of a coal fire

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[1] That is, the seeing eye, which according to Empedocles is fire, appears to be seen and so to be different from the eye itself.

[2] Because the smooth surface shines only in the dark.

[3] Cf. *De an.* 419*a* 5.

[4] *Timaeus*, 42 E, 43 A ff.; *Meno* 76 C.

[5] *Timaeus*, 45 B; cf. also *Theaetetus* 156 C.

8 or a flame, but neither of these has anything to do with light. If, however, they[1] are attributes of light but are concealed from us owing to their subtle presence, then light ought to be extinguished in the day during rain, and darkness should increase in frosty weather. Flame and ignited bodies are so affected, but nothing of the sort takes 9 place in the case of light. Empedocles appears to hold the view that vision results from the eye's radiating light, as we said before. His own words, at any rate, are as follows[2]:

> "As a man taking thought for his journey
> A lantern prepares, whose flame flashes light
> Through the blustering night, as he passes,
> And shutters he fastens, defence from winds,
> To scatter the breath of the blowing blasts,
> While the light pierces through, by its fineness,
> And gleams over the threshold unfailing;
> So, of old,[3] fire elemental was fixed
> 438 *a* In membranes, and suffused[4] the round pupil,
> Held in thin tissues, a check to the water,
> While the fire pierces through, by its fineness."

10 Sometimes he gives the above explanation of vision, and at other times he explains it by means of emanations from visible objects.[5]

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[1] The warm and the dry.

[2] Cf. Burnet, *Early Greek Philosophy*, p. 231.

[3] Instead of τό τ' read τότ'.

[4] Instead of λοχάζετο read ἐχεύατο.

[5] Each of these parts represents only half of the Empedoclean theory of perception. Light emanates from the fire in the eye, as from a lantern, and effluences come from sensible objects. These effluences enter into the pores or passages of the eye, and in proportion as these effluxes are fine or crass, they enter into the larger or narrower passages. The fire is in the interior of the eye, and between this and the outer covering is a mass of water held by a fine net. The fire in

Democritus says that vision is due to water, and in this he is right; but he is wrong in thinking that it consists in reflection. For reflection is produced because the eye is a smooth surface; vision, however, does not take place in this smooth surface but in the seeing subject. Now, the condition to which he refers is only a reflection of light. He has, however, as I think, no clear idea whatever concerning the general nature of images 11
and reflection. It is also strange that it never occurs to him to raise the question why it is that the eye alone sees, while no other object in which images are reflected, has vision. His statement that vision partakes of the nature of water, is true; but vision is not due to the fact that the eye is water, but to the fact that it is transparent, which characteristic it has also in common with the air. Water, however, is easier to fix and is 12
thicker than air, and it is for this reason that the eye and its pupil are composed of water.[1] This can be proved also from actual facts. When the eyes are destroyed water is seen to flow out of them, and even in their quite embryonic stage the eyes are exceedingly limpid and brilliant. Further, the white of the eye[2] in sanguineous 13
animals is fat and oily, which serves the purpose of keeping the humid element from congealing. Consequently, the eye can resist cold better than any other organ of the body. No one ever experienced the sensa-

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the interior by reason of its fine, subtle nature, penetrates through these, as the light penetrates through the sides of the lantern and out through the atmosphere. In this way the images thrown off from things are illuminated. Cf. Burnet, *Early Greek Philosophy*, p. 265.

[1] The aqueous and vitreous humours.

[2] The sclerotica.

tion of cold in the interior of the eye. The eyes of bloodless animals are covered with a hard skin which furnishes protection. The theory is altogether
14 irrational which makes vision consist, as some hold, in a sort of radiation, and regards this radiation of something from the eye as extending to the stars, or as extending to some point and there effecting a combination with the object. It would be better to assume that this combination of the eye with its object were in the eye's original nature. But even this is nonsense. For what is one to understand by this combination of light with light? Or how is such a thing to take place? For
438 *b* nothing combines in a haphazard way with anything else.
15 Further, how can the internal light combine with an external one, for between them is the intervening membrane. Regarding the fact that there is no vision without light, we have spoken elsewhere.[1] But whether the intervening medium between the visible object and the eye is light or air, it is in any case the motion through this medium that produces sight. And it is reasonable to regard the interior of the eye as composed
16 of water; for water is diaphanous. And as nothing external is seen without light, the same thing applies to the internal. The internal also must, therefore, be diaphanous. Since this diaphanous is not air, it must be water. For the soul or the perceptive power of the soul is not found on the eye's surface, but evidently
17 within. Consequently, the eye's interior must be diaphanous and sensitive to light. And this we can see empirically. For cases have happened in war where

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[1] *De an.* 418*b* 1, 419*a* 9, 430*a* 16.

persons have received such a blow across the temples[1] that the ocular conduits were severed and darkness seemed to ensue, just as when a lamp is put out, and this is due to the fact that the diaphanous, *i.e.* the pupil as we call it, was cut off, as in the snuffing of a 18
lamp. If, therefore, this takes place in some such way as we describe, it is evidently necessary to render an explanation of this kind and to correlate each sense-organ with one of the elements, viz. the seeing power of the eye we must derive from water, the sense for sound from the air, and smell we must associate with fire. For the organ of smell is potentially[2] what smell itself is 19
actually. The sensible object stimulates the sensation into actuality, and consequently the latter must have an antecedent potential existence. Smell[3] is a smoke-like exhalation,[4] and this is derived from fire. It is for this 20
reason, too, that the organ of smell is especially assigned to the environment of the brain, for the material sub-

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[1] The eye must be translucent, and therefore composed either of air or water, in order to transmit vision to the inner soul, vision not taking place on the eye's surface. This is proven by the fact that when the optic passages are severed, as Aristotle supposes, by a blow on the temple, one becomes blinded.

[2] Cf. *De an.* 417*a* 12 ff.

[3] *De an.* 421*a* 7 ff.

[4] Smell is considered by Aristotle one of the most difficult senses to analyze, which is due to the fact, he thinks, that it is very imperfectly developed in man. Taste is closely allied to it, but much better developed. The one is concerned with the 'sapid dry' (443*a* 7) and the other with the 'sapid moist.' Flavour is found in the moist only, while for respiring animals odour is found only in the dry. It can, however, exist in the moist as shown by the sense of smell in aquatic animals. For the latter reason it cannot be a 'smoke-like exhalation.' Aristotle appears here to be speaking only in terms of a current explanation. Cf. 443*a* 23 ff.

strate of cold is potentially warm. And the same explanation holds good for the development of the eye. It is formed from a part of the brain, for the brain is the
21 moistest and coolest member of the body. The organ of touch is derived from the element earth, and taste is a
439a form of touch. Consequently, the organs of these two senses, taste and touch, are found to conduct towards the heart. The heart occupies a counterposition to the brain and is the warmest member of the body. Regarding the sense-organs of the body let the above determinations suffice.

CHAPTER III.

In the treatise *On the Soul*[1] I have given a general account of the objects of sense in their application to the several sense-organs, such as colour, sound, smell, flavour and the tangible. I have explained their function and their activity, organ by organ. But we must also determine what each of these things is apart from the organ, *e.g.* we must ask: What is colour? What is sound? What is smell? What is flavour? We must likewise inquire regarding the tactual, and we must begin with colour. Everything has a twofold significance, viz. that 2 of actuality and potentiality. It has been explained in the treatise *On the Soul*[2] in what way actual colour and actual sound coincide with and differ from the actual sensations of seeing and hearing. We must now explain what each of these sensible objects must be in order to produce sensation and its activity. We have already said in the above-named treatise regarding light that it is the colour 3 of a diaphanous medium, accidentally produced.[3] For

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[1] *De an.* 418*a* 26—424*a* 16.

[2] *De an.* 425*b* 29 ff.

[3] Neither colour nor light belongs to the essential nature of the pellucid medium, which may be charged at one time with one colour and at another time with another, or in the case of darkness it may suffer privation of light.

when anything fire-like is found in the diaphanous, its
presence constitutes light and its absence signifies dark-
4 ness. What we understand by diaphanous is not a
property peculiar to air or water or to any other
so-called body, but it is a certain natural constitution
and power,[1] common to both these bodies and found
also in certain others, in greater or less degree, but
which has no independent and separate existence. And
furthermore, as there must be a limiting surface in
5 bodies, so here also. Light is found in an indeterminate
diaphanous. It is also evident that the diaphanous in
bodies must have a surface, and that this surface is colour
is plain from observed facts. For colour is found either
in the boundary or it is itself the boundary. It is for
this reason that the Pythagoreans[2] characterized the
visible superficies as colour. Colour, indeed, is given in
6 the boundary properties of body, although it does not
itself constitute that boundary. On the contrary, one
must suppose that the same colour-quality[3] which is
439 *b* observed on the exterior applies also to the interior.[4]
Both air and water are seen to be coloured, for even their
7 shimmer is colour. In these cases, however, air and

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[1] Aristotle rejected the view of Empedocles that light is motion and travels from heaven to earth (418*b* 20, 446*a* 26). Light is not motion, although it is caused by movement or change (ἀλλοίωσις). In its own nature it is a definite qualitative condition of the air or water, just as the frozen represents a condition of water (446*b* 28—447*a* 3).

[2] Cf. Plut. *Epit. Mem.* I. 15; *Stobaei Eclog.* I. 15 quoted by Diels *Dox. Gr.* p. 313.

[3] The treatise *On Colours* (περὶ χρωμάτων) is not genuine. Cf. Prantl, *Aristot. über die Farben*, pp. 82-84.

[4] Aristotle appears to have in mind such objects as jewels, whose colour he considers not merely superficial but as penetrating through the substance.

the sea, because of their unfixed character, do not have the same colour when viewed near at hand and from a distance. In solid bodies, on the other hand, the appearance of the colour is fixed, unless the surrounding medium makes it shift. It is evident, therefore, that the principle which is sensitive to colour is, in both the former and the latter instances, the same. The diaphanous,[1] then, in so far as it is found in bodies (and it is found 8 more or less in them all), causes them to be saturated with colour. Inasmuch as colour is found in the boundary of bodies, it would also be found in the boundary of the diaphanous substance. Consequently, colour might be defined as the boundary of the diaphanous 9 in a definite body. Colour attaches also to diaphanous bodies themselves, such as water and other similar elements, and it is also found in all such bodies as have a surface-colour which is peculiar to the body[2] itself. There is then, on the one hand, the possibility that the positive principle which in the air produces light should also be contained in the diaphanous; on the other hand, it is possible that this should not be the case, but that the condition then should be one of privation.

As in the case of air we have the two phenomena, light and darkness, so in bodies we have the two qualities, 10

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[1] The diaphanous is that which mediates colour, and light is that which converts the potentially diaphanous into the actually diaphanous. In other words, a diaphanous or pellucid medium, such as air or water, is not actually pellucid without light, but is dark. Colour has the power to set the diaphanous in motion (419*a* 10), by which means the images of remote surfaces affect the visual organ.

[2] Fire or some positive principle such as is found in the aether is supposed to illumine the diaphanous; the withdrawal of this is darkness or the privation of light.

white and black. Regarding the other colours we must
now decide, after analysis, in how many ways they can
be produced. For black and white may be so juxtaposed
that each of the two, on account of its minuteness, when
taken alone will be invisible, while the combination of
the two will be visible. The latter cannot be seen
11 either as white or black. But inasmuch as it must have
some colour, and it can be neither of these two, it must
be a mixed colour, and different in kind from the others.
It is, then, a possible supposition that there are several
12 colours besides white and black, but their manifoldness is
due to proportion.[1] This proportion can be expressed by
the relation of 3 : 2 or of 3 : 4, or colours can be related
to each other in terms of other numbers, and some may
not be expressible at all in terms of any proportion, but
in terms of some incommensurable plus and minus. The
same thing applies also to harmony of tones. Those
colours which are expressed by harmonious numbers, as is
also true of tone-harmonies, appear to be the most pleasing,
440a such as sea-purple, crimson, and a few others like them;
they are few for the same reason that harmonious tones
are few.[2] The other colours are not numerically expressible.
Or, is it true that all colours are numerically

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[1] White and black, the correlates of light and darkness, are the basal colours, as sweet and bitter are the basal flavours. Between these two extreme opposites there are intermediate colours, into which the primary colours are convertible by composition (*Phys.* 188a 32; 188b 21; 229b 14; *Metaph.* 1057a 23). These intermediate colours are red, violet, green, blue, and yellow. Gray is included in black, and is not regarded as an independent colour, while yellow is perhaps included in white (442a 22). Cf. Goethe, *Farbenlehre* (ed. 1810), Bd. II. pp. 11-52.

[2] In the first place because they do not form a continuum, and so are not infinitely or indefinitely divisible, and secondly because they are objects of feeling.

expressible, although some colours depend upon a regular order, while others depend upon an irregular order, and the latter have this character when they are not pure? This is one[1] explanation of the genesis of colours; another[2] explanation is that they shine through one another, as we 13 see sometimes in the works of artists, when they superadd a colour on a background of a different colour, *e.g.* when they wish to produce the effect of an object seen in the water or in the air. So it is also with the sun, which in its own nature appears white, but red when seen through mist and smoke. And many other colours will be pro- 14 duced in the same way as above described. That is to say, a certain proportion might be supposed to exist between the colours on the superficies and the colours in the depths, and others again may not be expressible in terms of 'proportion' at all. It is, therefore, absurd to 15 say with the ancients that colours are effluxes, and for this reason are visible. For in their opinion it is absolutely necessary that sensation be effected through contact, and it is consequently better to say at once that the medium of sensation is set in motion by the sensible object, and that in this way sensation is produced by contact and not by effluxes. In the case of juxtaposed 16 colours, just as one must suppose an invisible magnitude, so must one suppose an imperceptible moment of time, in order to explain the fact that the movements issue imperceptibly, and because they are simultaneously visible the impression is a single one. There is, however, no such necessity here, but the colour on the superficies

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[1] Viz. the number-theory which Aristotle rejects.

[2] Also this theory of superposition is rejected.

when unmoved, and when set in motion by its substrate,
produces unlike motions in the medium. Consequently,
it appears different, and neither white nor black. So
17 that if an invisible magnitude is not possible, but every
magnitude must be visible from a certain distance, so
there must be here also a certain mixture of colours. In
this way one may suppose that in objects viewed from a
distance a certain common colour is seen. For that there
18 is no invisible magnitude is a matter that must be investigated
440b later. If a mixture[1] of bodies takes place, then
it is not merely in the way that some think, viz. by the
juxtaposition of minimal parts which are imperceptible to
our senses, but also in the form of a general mixture of
the entire substance together, as explained in outline in
19 our treatise *On Mixture*.[2] By the former method of composition
only those substances can be mixed which are
capable of analysis into minimal parts, *e.g.* men, horses, or
seeds. In the case of 'men,' a man is the minimal
part;[3] in the case of 'horses,' a horse. Consequently, in
both instances the mass is formed by juxtaposition of
these minimal parts. We do not, however, speak of a
20 man being mixed with a horse. Whatever cannot be
analysed into minimal ([homogeneous]) parts, is incapable
of mixture in this sense, but only in the sense of total

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[1] The first two theories, viz. the numerical and the superpositional, are here rejected in favour of the theory of substantial mixture.

[2] This treatise (περὶ μίξεως) has been lost. For Aristotle's definition of mixture, and his distinction between it and synthesis, see *De gen. et corr.* 328*a* 5 ff. The former implies homogeneity, while the latter may be merely mechanical juxtaposition. The former produces a whole, the latter an aggregate (321*a* 34).

[3] Read ἐλάχιστον for ἐλάχιστος. Cf. *Berliner Wochenschrift für class. Philol.*, 1898, p. 998.

mixture, which is what naturally takes place in most cases. In our treatise *On Mixture* we have already explained how this can take place. Where bodies are 21 mixed their colours must evidently be mixed also, and this is the principal cause of the multiplicity of colours, which is not explained by their being superposed or by their juxtaposition. It is not true that what is mixed has one colour when viewed near by, and another when viewed at a distance, for it has one colour when viewed from all points. And colours will be manifold because of the possibility of manifold proportions 22 being employed in mixtures, some of which will be based on numerical proportion, others on that of disproportionate mass. Further, the same thing may be said of mixed colours as was said of juxtaposed and superposed colours. The explanation of the fact that we have fixed and definite varieties of colours, flavours, and sounds will be given later.[1]

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[1] Cf. *De sensu*, 445*b* 3 ff.; 446*a* 20.

CHAPTER IV.

WE have now explained the meaning of colour and the cause of its multiplicity. We had already discussed the subject of sound and articulate speech in the treatise *On the Soul*.[1] Smell and flavour now remain to be discussed. Both these terms signify almost identical natural affections, only each of them is found in a
2 different organ. The quality of flavours is more distinct to us than that of smells. The reason is that our sense
441 *a* of smell is inferior to the same sense in other animals, and is inferior to all our other senses, while we of all animals have the most accurate sense of touch, and taste
3 is a sort of touch.[2]

Water in its own nature has no flavour. And yet it is necessary that water should contain within itself the varieties of flavours, which owing to their infinitesimal character are indiscernible, as Empedocles[3] says, or else there must be in water some such matter as is

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[1] *De an.* 420*b* 32.

[2] *De an.* 423*a* 19.

[3] Other than this we have no knowledge of the Empedoclean theory of taste, with the exception of the statement in fr. 139 that flavours depend upon adaptability to the sense-pores. Cf. Burnet, *Early Greek Philos.* p. 265.

the universal germ-origin of flavours,[1] and in this way
all flavours are generated out of water, different flavours
from different parts; or again, supposing that water
contains no qualitative differences, we must then find
some other efficient cause of flavour, such as heat or
the influence of the sun. The error of the Empedoclean 4
theory is very easy to detect. For we actually observe
flavours undergoing change under the influence of heat,
e.g. when we expose fruits to the sun by removing
their pericarps or by heating them before a fire. They
do not acquire this new flavour by drawing it out of
the water, but by undergoing a change in the removal
of the pericarp itself. When fruits are dried and stored
they become in time, instead of sweet, pungent or bitter,
or change their flavour variously, and when cooked they
acquire, so to speak, all sorts of flavours. So too, the
theory that water is a panspermic matter is impossible. 5
For we observe that out of one and the same thing,
as out of the same food stuff, different flavours are
generated. There remains the theory that water by
undergoing some external influence, changes. It is plain 6
that the phenomenon which we call flavour is not due
to the potency of heat. For water is the thinnest of
all liquids, subtler than oil itself. Oil, however, is more
expansile than water because of its viscous character,

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[1] I think the reference here is more likely to Anaxagoras than to Democritus, as Wallace supposes (Aristotle's *Psychology*, Introd. p. lxvi), although both of them are said to have used the term πανσπερμία. The description of the theory (441*a* 19) as one of dynamism would conform better with the general principles of Anaxagoras than with the mechanical philosophy of Democritus. In strictness, πανσπερμία is a term which Democritus could not legitimately use.

water being non-cohesive. For this reason it is harder
to hold water in one's hand than it is to hold oil.
7 Now, since water is the only liquid which when heated
exhibits no denser consistency than before, we must
evidently look elsewhere for the cause of flavour. For
all flavours are more dense when heated. Heat is a
contributing cause ([not the sole one]). Apparently the
441 b flavours that are found in fruits have a prior existence
8 in the earth. In the same spirit many of the ancient
physiologers[1] say that water is like the soil through
which it passes, and this is particularly evident in the
case of salt waters, for salts are a form of soil. Also,
water that has been filtered through bitter ashes acquires
9 a bitter taste. Further, we often find springs that are
bitter and others that are pungent, while others still
have different flavours. The greatest variety of flavours
is found, as one might suppose, amongst plants. It is
the nature of moisture, as of other things, to be affected
by its opposite and its opposite is the dry. Consequently,
it is affected by fire, which is by nature dry.
10 Now, heat is the peculiar property of fire, and the dry
is the peculiar property of the earth, as was said in
the treatise *On the Elements*.[2] Neither fire, nor earth,
nor any other element, as such, acts or is acted upon.
It is only in so far as each thing contains in itself the
principle of opposition that it either acts or is acted upon.[3]

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[1] Lewes finds this idea expressed in Hippocrates. Cf. *Aristotle*, p. 250.

[2] The reference is probably to *De gen. et corr.* 329b 18–330b 9. On the lost treatise περὶ στοιχείων see Heitz, *Die verlorenen Schriften d. Aristoteles*, p. 76.

[3] A thing acts or is acted upon through certain of the qualities possessed by it and through the action of opposing qualities.

As, therefore, those who dissolve a colour or a 11
flavour in water, cause the water to absorb it, so
nature acts upon the dry and earthy elements, and
by filtering water through these elements and stimulating
them into activity by heat, it causes the moist
element to acquire a certain quality. This condition, 12
which is wrought in moisture by means of the above
mentioned dry element, is flavour, and it consists in
the conversion of a potential |taste into an actual one.[1]
For the sense-organ which is already in a condition of
potentiality, passes over into a condition of actuality.
The process of sensation does not resemble learning so
much as it resembles contemplation. That flavours do
not attach to everything dry, but only to the dry that 13
is nutritive, either as a positive or negative condition,
one may conclude from the fact that the dry is not
found apart from the moist nor the moist apart from
the dry. Neither one when taken alone is food-stuff
for living creatures, but only when combined. In
animal food it is the tactual elements which effect 14
growth and decay. And it is by virtue of the warmth
or cold in the assimilated food that these phenomena
are produced. For these are the properties that cause
growth and decay. The administered food nourishes in 442 a
so far as it is gustable. For everything is nourished
by means of the sweet, whether pure or mixed. This 15
subject must be more definitely treated in the work

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[1] The gustable or flavour (χυμὸς) is described at 441*b* 19 as an effect produced in a moist substance by that which is dry. Flavour is therefore, the sapid moist, while the object of smell is described (443*a* 2) as the 'sapid dry.' The odoriferous and the gustable (savour and flavour) are closely allied.

On Generation[1]; for the present we only touch upon it so far as necessary. Heat disposes to growth and brings food into a prepared condition; it absorbs what is light and rejects the salt and bitter because of their heaviness. What external heat effects in external bodies, is also produced by internal heat in animals
16 and plants. Nourishment, then, is caused by the sweet. The other flavours are mingled in food in the same way as the bitter and pungent, *i.e.* to serve as a relish. This is for the purpose of counterbalance, and because the sweet is over-nutritive and swims on the stomach.

As colours are a combination of white and black, so flavours are derived from sweet and bitter. They depend
17 severally on a proportion of more or less, on a proportion of mixture and motion either numerically expressible, or indeterminate. Those mixtures, however, which produce pleasure are numerically expressible. The oily flavour is to be classed with the sweet; the salt and bitter are closely allied, while the sour, pungent, astringent, and
18 acid are intermediary. And so the varieties of flavours and colours are pretty nearly the same in number; for there are six of each, if one regards, as is reasonable, the gray as a sort of black.[2] We have then to include yellow in white, just as we referred the oily flavour to the

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[1] Aristotle is here referring to the subject of growth and decay, not to the nature of taste. The subject is treated in *De gen. et corr.* 320a 8 ff.

[2] And further, if one regards yellow as a species of white. Otherwise we have seven colours as enumerated at note 2, p. 87. I have retained Susemihl's conjecture ἕξ for ἑπτά, adopted by Biehl (cf. Alexander Aphrod. *Comment. ad loc.*). Prantl, however, calls the Aporia of Alexander "ungeschickt" (*Aristot. Ueber die Farben*, p. 117).

sweet, while crimson, sea-purple, green, and blue, are intermediary between white and black, and all other shades are combinations of these. As black is privation 19 of the white in a diaphanous medium, so the salt and bitter are privation of the sweet in a nutritive moist substance. Consequently the ashes of anything that has been burnt are bitter; for the potable element has been consumed.

Democritus and most of the physiologers who treat the subject of sensation make the most remarkable blunder, for they resolve all sensible objects into the tangible. If, 442 b indeed, this is correct, each of the senses becomes evidently 20 a sense of touch. It is not difficult to see that this is impossible. Further, they treat the common functions of all the senses as special functions. For the perception of magnitude, figure, roughness, smoothness, and sharpness and bluntness in solid bodies, is the common function of all the senses, and if not of all, then at least the common function of sight and touch. It is in these perceptions, 21 therefore, that the senses are subject to error; but they are not subject to error in their special sensations, *e.g.* sight is not fallible regarding colour nor hearing regarding sound. Again, these physiologers refer the special functions to the general, as Democritus does with white and black,[1] the latter of which he identifies with the rough and the former with the smooth, and he

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[1] White is due to smooth atoms and their aggregation in a smooth surface. Black is due to rough and uneven atoms and their aggregation is a rough and uneven surface (cf. Theophrastus *De sensu*, 73). Further, however, the quality of the visible is affected by the rapidity of motion in the effluxes and by the condition of the air itself (Theoph. *De sensu*, 80).

reduces flavours[1] to atomic forms. And yet it is either not the function of any sense to discern common properties, or else this power belongs to the eye more
22 than to any other organ. If, however, this power falls rather to the lot of taste, it is at any rate the function of the most delicate sense to discriminate the slightest distinctions, each after its kind, so that taste would have to discriminate common properties better than any other sense and be the most discerning judge of
23 atomic figures. Further, all sensible objects contain the principle of opposition, *e.g.* in colour black is the opposite of white, and in flavour bitter is the opposite of sweet; but one figure does not appear to be the opposite of another figure, for to what sort of polygon would a circle be
24 opposed? Further, the atomic figures being infinite in number, it necessarily follows that flavours are also infinite in number. For what is the explanation of the fact that one flavour produces a sensation and another flavour does not produce it?

We have now treated the subject of the gustable and flavour. The other aspects of flavour receive their proper consideration in the treatise *On the Physiology of Plants.*[2]

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[1] Flavour-qualities are explained by Democritus in a way similar to variations in colour, *i.e.* white and black are analogous to sweet and bitter. Sweet is due to round smooth atoms; bitter to rough and angular ones (Theoph. *De sensu*, 65, 66).

[2] The two books on plants (περὶ φυτῶν) are frequently referred to by Aristotle (468*a* 31, 467*b* 4, 656*a* 3, 783*b* 20) and are mentioned in the catalogue of Diogenes Laertius, but were apparently lost as early as the time of Alexander Aphrodisiensis (*flor. circa* 220 A.D.); cf. Zeller, *Aristotle*, Eng. tr. Vol. I. p. 91.

CHAPTER V.

N like manner one must also treat of smell. For the ame effect which is produced by the dry or the moist, is roduced in another connection by savoury moisture in ir and water equally. Now we observe that the iaphanous is a common principle in these two elements; he element, however, is not odoriferous by virtue of its eing diaphanous, but by virtue of its capacity to exude 443 a nd throw off dry savour. For smell is exercised not nly in the air but also in water. This is evidently so n the case of fishes and mollusks[1]; for these are known 2 o be endowed with smell although there is no air

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[1] The Testacea (ὀστρακόδερμα), as used by Aristotle, include the ollusca (in the modern meaning), excepting the Cephalopods. They nclude also the Ascidians and Echini, although these are sometimes rouped by Aristotle amongst the Zoophytes. The Testacea form the west group in the animal scale, lacking as they do the power of comotion and the higher senses, as sight and hearing. The Mollusca αλάκια) correspond to the modern Cephalopods, and the Crustacea αλακόστρακα) include the crabs, crayfish, lobster, etc., which have a ft interior and a shell-like exterior, the shell being, however, flexible nd not brittle as in the case of the Testacea. These three classes nd the Insecta (ἔντομα) form Aristotle's four classes of bloodless nimals. Cf. Ogle's *Aristotle on the Parts of Animals*, pp. xxix, 222; eyer's *Aristoteles Thierkunde*, pp. 159 ff.

in the water (for the air comes to the surface when found in water) and they have no respiration. If one assumes that both air and water are moist elements, smell would be the dry sapidity in the moist and such
3 would be the nature of an odoriferous body. That this condition in an object is derived from a sapid element is a plain conclusion from things that do and do not emit smell. For the simple elements, such as fire, air, earth, and water, are non-odorous because the moist and dry in them are non-sapid, excepting when a combination is
4 produced. This is why even the sea has a smell; it contains a sapid dry element. Salts are more odorous than nitre, as is proven by the oil derived from them. Nitre, in turn, is more odorous than earth. Further, a stone is inodorous, for it is without sapidity; woods, on the other hand, are odorous, for they are sapid, and amongst woods those that are watery are less odorous.
5 Further, amongst metals gold is inodorous, for it is not sapid; bronze, however, and iron are odorous. When the moist element is burned out of metals, the slag becomes still less odorous. Silver and tin are more odorous than some and less odorous than other metals;
6 for they contain moisture. Some writers regard smell as a smoke-like exhalation which is common to earth and air [and all the naturalists fall back on this explanation of smell]. And so Heraclitus made the remark that if
7 all things were smoke, we should discern everything by our nostrils. Now, the naturalists all explain smell on this theory, some of them describing it as vapour, others as an exhalation, and others as a combination of both of these. Vapour is a kind of moisture, whereas a smoke-

like exhalation is, as we have said, common to air and earth. Water is derived from vapour, and a sort of earth is developed from smoke-like exhalation. But neither of these two seems to be the odorous. For vapour 8 is due to water, while smoke-like exhalation cannot possibly be generated in water. And yet creatures that live in the water have the sense of smell, as was said above. Again, exhalations here have the same meaning as emana- 443 *b* tions, and if the emanation theory was wrong, so is this wrong. It is clear that the moisture which is found in 9 the air (for the air also has a moist character) and in water is capable of deriving something from the sapid dry element and of being affected by it. Furthermore, if the dry element, when saturated, as it were, acts in moisture in the same way as it does in air, smells must evidently correspond to tastes. But precisely this fact is found in 10 certain flavours and savours. For there are pungent, sweet, harsh, astringent, oily smells, and one might say that rancid odours correspond to bitter tastes. As the former, therefore, are revolting to the taste, so rancid tastes are revolting to the smell. Evidently, then, that quality which in water is flavour, in air and water is smell. This explains why cold and frost blunt flavours 11 and obscure smells. For cold and frost nullify heat, which is the moving and active principle here.

There are two sorts[1] of odorous objects; for it is untrue that there are no varieties of odorous objects, as some maintain. Such varieties do exist. One must, however, explain in what sense this is true and in what 12 sense not true. One variety corresponds, as clearly

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[1] The agreeable and disagreeable.

explained, to flavour, and contains the pleasurable and
painful accidentally. For owing to the fact that these
smells concern our nutritive power, they are agreeable to
those who have desire and disagreeable to those who are
sated and feel no desire. Neither is the smell agreeable to
those to whom the food which has the smell is disagreeable.
13 Consequently, these smells contain, as we said, the pleasant
and painful accidentally, and this is the reason why they
are common to all animals. There is another variety of
smells which are pleasant in themselves, *e.g.* the fragrance
of flowers. For they incite us in no respect, whether more
or less, to food, nor do they in any way contribute to the
stirring of any desire; they have rather the opposite
effect. What Strattis[1] says, mocking Euripides, is true:

When lentil-soup you cook,
Pray, add no spices to it.

444 *a* By mixing such spices in their potations, men now-a-days
14 force pleasure, as is their habit, believing that the
pleasure which is really derived from two sensations[2] is
15 derived from only one. Smell of this sort is peculiar to
man, but smell that is based on flavour is sensed by
other animals,[3] as remarked above. The varieties of the

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[1] Strattis, of Athens, the comedian (*flor.* 410 B.C.). Cf. Meinecke, *Fragm. Com. Graec.* p. 436.

[2] The pleasures of eating and drinking are combined from smell and taste.

[3] The qualities of smell are few and inexact, because of the lack of development of this sense in man (*De an.* 421*a* 10). Man possesses the most delicate sense of touch and the worst sense of smell. In the lower animals smell is merely a handmaid of touch, while in man it not only serves in this capacity but interprets the odoriferous world as pleasant and unpleasant *per se*, *i.e.* apart from its association with flavour.

latter, because the pleasant is incidental, are classified in
terms of flavours, which does not apply to the former
class, because there the smell is pleasant or disagreeable in
itself. The reason why this class of smells is peculiar
to man is because of the condition of his brain. For 16
man's brain is by nature cool, and the blood in its
surrounding veins is thin and pure, though easily chilled
(which explains why the evaporation of food when cooled
in this region causes catarrhal colds), and so this variety
of smell has been developed in man as beneficial to his
health.[1] For no other function can be ascribed to this
class of smells, although this function is evidently 17
exercised by them. Food, whether solid or liquid,
although agreeable, is often harmful; but the smell
exhaled from savoury food indicates, one may say, what is
absolutely and always beneficial to man in whatsoever 18
condition he is. Consequently, smell is mediated by
respiration, not in all animals, but in man, the quadrupeds
and such other sanguineous animals as have a
larger share in the employment of air. For smells being
transmitted to the brain by virtue of the levity of the
heat in them, the regions about the brain are thereby
the more healthy. For the potency of smell is naturally
warm. *Nature employs respiration for two purposes; 19
its main purpose is to assist the functioning of the
chest; its secondary function is to transmit smell. For
in respiration the air produces, as it were in passage,
motion in the nostrils.[2]* Smell of this sort is peculiar to 20

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[1] Owing to their warm, dry nature.

[2] This sentence is out of connection with the following one, and the passage enclosed in asterisks should probably be inserted at the mark† 444b 7.

human nature, for man has, in proportion to his size,
the largest and moistest brain of all animals. For this
reason man is the only animal, one may say, that senses
the smell of flowers and similar smells, and finds pleasure
in them. For the warmth and movement in these
444 *b* smells is proportional to the excess of moisture and
coolness in the brain. To the other animals that are
21 endowed with lungs for respiration, nature has given the
perception of another kind of smell, so as to avoid the
creation of two sense-organs. It is enough for these
respiring animals that they have the sensation of only
one class of smells, while man discriminates both
22 classes. †That the non-respiring animals possess the
sense of smell is evident. For fishes and all the varieties
of insects, on account of the connection between food and
smell, distinguish smells with precision and at a distance,
as we observe in the case of bees and that variety of
small ants sometimes called cnips[1] and purple sea-fish,
as well as in the case of many other similar animals which
have a keen sense of smell for food. The organ of sensation
23 is not so clearly defined. One might, therefore, raise the
question as to the organ of the sense of smell, although
smell is mediated exclusively by respiration (this is
plainly so in all respiring animals). None of the above-
mentioned animals, however, respire, and yet they
perceive smells, unless we are to assume an additional

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[1] The term 'Cnips' has come into use in Zoology to describe a beetle allied to the Cryptarcha (cf. E. Reitter, *Verh. Ver.*, Brünn, xii. 1873, p. 163). The reference here, however, appears to be to some small variety of ant such as the *formica flava*, or to the common red ant (*monomorium pharaonis*, cf. Comstock, *Manual for the Study of Insects*, p. 643).

sense beyond the five, and this is impossible. For it is 24 smell that senses the odorous, and these animals detect odour, though perhaps not in the same way as respiring animals. In respiring animals the breath lifts up a superficial membrane, a sort of cover, as it were (for which reason they do not smell without respiration), whereas in the non-respiring animals[1] this is lacking, just as over the eyes some animals have eyelids and without lifting these do not see, while others are hard-eyed and have no lids, and so do not need to lift any covering, but see at once from the moment they are able to see. And 25 so, too, no other animal feels discomfort from a smell which is intrinsically malodorous, unless it chances to be harmful. But by these harmful smells animals are sometimes destroyed, just as men often get a headache from coal-gas and frequently lose their lives. In the same way other animals are destroyed by sulphur and asphalt fumes, and because they are so affected by such 445 *a* fumes they avoid them. But for malodour, as such, they 26 take no thought (although many vegetables have bad smells), excepting in so far as taste or food is influenced 27 by it.

Inasmuch as the number of the senses is uneven, and every uneven number has a middle term, it seems that smell occupies a middle position between the senses that

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[1] In aquatic animals gills perform a function analogous to the lungs in respiring animals. A similar function is performed in insects by the membrane at the junction of abdomen and trunk (*De resp.* 478*b* 15, 475*a* 8). The gills in fishes and the membrane in insects do not, however, appear to mediate smell, as the lungs do in respiring animals. Owing to the semi-tangible nature of odour, it appears to act directly in these cases, *i.e.* by impinging immediately on the sense-organ without the assistance of inhalation.

operate by direct contact, viz. touch and taste on the one
28 hand, and those which function indirectly through a
medium, viz. sight and hearing on the other hand.
Consequently, the odorous object is something which
affects foods (for these fall under the category of the
tangible), and, further, it affects audition, because smells
are sensed in the media of air and water. Smell,
then, is in a way common to these two things, and is
found in the tangible, the audible, and the diaphanous.
It is with good reason, therefore, that smell has been
compared to the imbruing and washing of a dry element
29 found in the moist and liquid. Regarding the sense in
which one may or may not apply the term 'species' to
odours, let the foregoing discussion suffice.

There is a view held by certain Pythagoreans, which is
ill-founded. They hold that certain animals feed on
30 smells. Now we observe, in the first place, that food is
a composite thing, for the creatures which are nourished
are not simple, and consequently there is an excrement of
food, sometimes within the animal itself, and sometimes
external, as in the case of plants. Further, water when
taken alone and unmixed is not fitted to yield nourish-
ment, for what is assimilated into the body must be of a
solid nature. Again, it is much less reasonable that air
31 can become solid matter. In addition to this, we observe
that all animals have a receptacle for food, from which
after its entrance the body assimilates it. The sense-
organ, however, is situated in the head, and smell enters
with a breath-like inhalation, so that it penetrates to the
32 respiratory region. That smell, as such, does not contri-
bute to nourishment, is plain. That it does, however,

contribute to health, is evident from the sensation itself and from what has been said,[1] so that what flavour is to the nutritive organ and to the parts nourished, this smell is to health. Let these, then, be our conclusions regarding the several sense-organs. 445 b

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[1] Namely from its association with food and from the effect of inhaled warmth on the head.

CHAPTER VI.

One might raise the question whether, supposing all
bodies to be infinitely divisible, the sensible qualities of
bodies are also infinitely divisible, such qualities as colour,
flavour, smell, sound, weight, cold, heat, lightness, roughness,
and softness. Or must we say that this is impossible?
For every one of these qualities produces
sensation. They all receive their name from their
2 capacity to stimulate sensation. Therefore sensation
must be infinitely divisible, and every magnitude must be
sensible. For it is impossible to perceive a white object
without its having dimensions. Were this not true, it
would be possible to have a body without colour or
weight or any similar quality, in which case it would be
3 absolutely imperceptible, for these qualities constitute
the sensible. The sensible then would have to be composed
of the non-sensible. But it must be composed of
sensible qualities, for it cannot be composed of mathematical
elements. And, furthermore, what organ could
we use for the discrimination and cognition of such
elements? Could we employ reason? But they are not
rational elements, neither does reason think the external

world, excepting in conjunction with sensation.[1] At the
same time, if this view of the infinite divisibility of sensible
qualities were true, it would appear to furnish support for
the advocates of atomic magnitudes. For in this way the 4
problem would be solved. It is, however, impossible.
This subject has been discussed in our treatise *On Motion*.[2]
In the solution of these questions one will see why it is
that the various forms of colour, flavour, sound, and other
sensible qualities, are determinate. For in things that
have extremes, the internal properties must also be
determinate. The opposite is an extreme. Now, every 5
sensible quality implies opposition, *e.g.* in colours, white and
black; in flavour, sweet and bitter. And in everything
else the opposites form extremes. The continuous is there-
fore divisible[3] into infinite unequal parts, but into deter-
minate equal parts. Now, whatever is not in its own nature
continuous is divisible into determinate forms. Inasmuch 6
as qualities must be interpreted as forms, and inasmuch
as continuity is always given in these, we must suppose
a difference between the potential and actual. This is
why the ten thousandth part of a visible grain of millet
is unseen, although the eye rests upon it, and so too a 446*a*
quarter tone is undetected by hearing, although the whole

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[1] Reason thinks the external world only in terms of images, which are derived from sensation (*De an.* 432*a* 8).

[2] The reference is to the last three books of the *Physics*, which are often referred to by Aristotle as περὶ κινήσεως (cf. 272*a* 30, 299*a* 10, 318*a* 3, 1049*b* 36). The particular reference here is to the discussion of 'continuity' and 'divisibility' in *Physics*, 213*a* 21 ff.

[3] All magnitudes are infinitely divisible (*Phys.* 206*a* 10 ff.), and all number is capable of being infinitely increased. Although magnitudes are infinitely divisible, their infinity is only potential. The infinitely small particle has only a notional existence.

7 continuous melody is heard. But the interval from
mean to extreme is not appreciable to us. And the same
thing applies to the excessively small amongst other
sensible objects. They are discernible potentially, but not
actually, and when regarded in isolation. A foot-line is
contained in a two-foot line potentially, but actually only
8 after division has been made. When excessively small
parts like these are separated off, it is reasonable to
suppose that they would be lost in their environment,
9 just as a tiny particle of flavour is lost in the sea.
Nevertheless, since this excessively small particle, when
regarded in itself and in isolation, is imperceptible (for the
excessively small has only a potential existence in a body
that is more discernible), neither is any sensible object of
this sort, in isolation, actually perceptible, and yet it is a
sensible object, because it is so potentially, and will be
actually so, when added on to something. We have now
10 explained that certain magnitudes and qualities are imperceptible,
and have stated the reason for this, and have
shown in what sense things are perceptible, and in what
sense they are not. When, however, inherent qualities
are so constituted in reference to themselves as to be
actually perceptible, and not merely so in conjunction
with an entire body, but also when regarded alone, then
11 colours, flavours, and sounds, must be numerically limited.

One might raise the question whether sensible objects or the movements excited by sensible objects—whatever be the way in which sensation is effected by their activity—are first transmitted to a medium, as appears to be the case with smell and sound. For a person standing near by has an earlier perception of a smell,

and a sound reaches one sometime after a blow. Is the 12
same thing true of the visible and of light? According
to Empedocles sunlight is first transmitted to a medium
before it reaches the eye or the earth, and this seems to 13
be reasonable. For whatever is moved is moved from
one point to another, so that a certain time must elapse
in which motion from one point to another takes place.
But all time is divisible, and consequently there is a
moment when the ray is not yet visible, but is still in 446 *b*
transit in the medium. Also if everything at the same 14
moment hears and has heard, and in a word perceives
and has perceived and there is no time process in
sensations, nevertheless they lack this process in the
same way[1] in which sound, after the blow has been
struck, has not yet reached the ear.[2] The shifting of 15
letters also shows this plainly, because their movement
takes place in a medium. For people appear not to
have heard what was said because the air[3] has shifted. Is
this true also of colour and light? For it is not owing 16
to a particular condition that one thing sees and another
is seen, like two equivalent terms. For it would not
then have been necessary for either to be in a given
position. For when things are equivalent, nearness or
remoteness from each other makes no difference. It is 17
reasonable that succession in time should be found in
sound and smell, for like air and water, they are

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[1] Read *ὁμοίως* for *ὅμως*.

[2] The passage of time has taken place in the medium, although one may not be conscious of it. Aristotle defines time as the measure or number of motion (*Physics*, 219*a* 10 ff; *De coelo*, 279*a* 14).

[3] The letters have become shifted in the air or medium, so that one hears a word wrongly.

continuous, and yet their movement is divisible, and so it sometimes happens that the nearest and most remote persons perceive the same smell, and at other times this is not the case.

18 Some persons find a difficulty also in the following. It is impossible, some say, for different persons to hear, see, or smell the same thing in the same way. For it is impossible for several persons who are separate from each other to hear and smell alike; in that event the 19 unitary object of sensation would have to be separated from itself. The primary stimulus, as a bell, frankincense, or a fire, is perceived by all as numerically one and the same, but in its peculiar qualities it is perceived with numerical differences, though in its essential nature as one and the same thing; for which reason many persons see, smell, or hear the same thing at the same time. One is not concerned here, however, with bodies, but with qualities and motion (otherwise we should not have this phenomenon), which are impossible apart from body. 20 The question of light is different; for light has a substantial nature and is not a motion[1]; in general the same determinations are not to be applied to transformation and motion. Spatial motions take place, as one might suppose, first into a medium (sound is thought to be the motion of something subject to spatial change), 447 *a* whereas that which undergoes transformation does so in a way different from spatial change. It is possible that transformation takes place in mass and not first by

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[1] Empedocles had described light as motion (cf. *De an.* 418*b* 20). Aristotle on the other hand regards it as a qualitative change in the diaphanous. It, therefore, represents a condition in a physical body (air or water), *vid.* note 1, p. 159.

halves, as in the case of water which freezes at once 21
entire. Nevertheless, if what is being heated or frozen should be of considerable bulk, one part is affected by the adjacent part, and the first part undergoes changes through its own alteration, and it is not necessary that the entire mass undergo alteration at the same time.
Taste would also be subject to the same conditions as 22
smell, if we lived in a medium of water and perceived smells from a distance without contact. When we have a medium for the sense-organ, it is reasonable to suppose we do not receive all our impressions at once, excepting in the instance of light, on grounds already mentioned. And sight is also excepted on the same grounds, for light is the cause of sight.

CHAPTER VII.

Another similar problem touching sensation arises here, viz. whether or not it is possible to experience two sensations at one and the same moment of time, supposing it to be true that the stronger stimulus always displaces the weaker. For this reason, persons do not see an object that falls upon the eye, if they chance to be deep in thought, or exercised by fear, or listening to a loud sound. Let
2 this serve as a fundamental truth and let us also observe that it is easier to perceive what is simple than what is mixed, *e.g.* it is easier to taste unmixed wine than mixed, and so with honey and colour, and it is easier to distinguish the highest note when taken alone than when heard in accord with the octave, because the two things
3 obscure each other. This occurs in cases where a unity is produced from several elements. If, then, the stronger displaces the weaker stimulus, it must happen, in case they are simultaneous, that even the stronger stimulus becomes weaker than it would be if it were perceived alone. For the weaker when mixed with it detracts from its clearness, supposing it to be true that every-

thing taken simply is more accurately perceptible. If the two are equal neither one will be perceived, for they will counteract each other equally. But it is impossible 4 to have a simple sensation. Consequently, we shall have either no sensation at all or a new one fused out of both elements. And this appears to be what actually happens with mixed elements, so long as they are mixed. Since 5 a fusion of certain things is possible and of others not, the latter are such as fall within the province of different senses. (For where extremes are opposite, fusion is possible, but it is not possible to form white and acute 447 b into a unity, excepting in an accidental sense, not however in the sense in which a union between acute and grave is possible.) It is, then, impossible to have a simultaneous sensation of these qualities. For the 6 stimuli being equal destroy each other, since a unitary stimulus is not derivable from them. If, however, they are unequal, the stronger stimulus produces the sensation; for the soul more readily perceives two stimuli simultaneously when only one sense is concerned in the single act of sensation, as *e.g.* acute and grave. For simultaneous sensation on the part of a single sense is more easily attained than is the action of two senses, such as sight and hearing. But it is not possible to perceive 7 two things simultaneously with one sense unless they are fused. For the fusion will form a unity and a single sense can perceive a single thing and the single sensation is a chronological unit. So then one necessarily perceives fused stimuli simultaneously, because they are perceived by a sense-process which in actuality is single. The single sense in actuality perceives a numerically

single object; the single sense in potentiality perceives a specifically single object.[1] If the sensation, therefore, is in actuality single, it will interpret the sense-object
8 as a single thing. The sensations must then be fused. When they are not fused, the sensations will be in actuality two. However, there must be a single actuality which corresponds to a single potentiality and a single moment of time; for the stimulation and exercise of a single sense is once for all single and its potentiality is single. It is consequently impossible to
9 perceive two objects at one time with a single sense. But if two objects that fall under a single sense cannot be perceived simultaneously, this is plainly much less possible when they fall under two senses, as *e.g.* white and sweet.[2] For the soul seems to denote what is numerically one not otherwise than in terms of simultaneity; the specifically one in terms of the discriminating sense and
10 the character of the thing. By this I mean that white and black, which are specifically different, are supposedly discriminated by the same sense; also sweet and bitter are discriminated by the same sense, although a different sense from the former one. On the other hand, the method of perceiving opposites is different, while co-ordinated pairs are perceived in the self-same manner, *e.g.* just as taste perceives the sweet, so sight perceives the

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[1] Actual sensation concerns only a given quality, *e.g.* white; potential sensation, on the other hand, concerns a given kind of quality, *e.g.* colour.

[2] Aristotle concludes that the only way in which several sensations may be simultaneously experienced is by their fusion. By the process of fusion, however, they are reduced to unity and the sense experience is no longer manifold but unitary.

white; as the sense of sight perceives the black, so the former sense perceives bitter. Further, if the sense- 448 a processes of opposites are opposite to each other, and if it 11 is impossible for opposites to coexist in the same indivisible thing, then where opposites fall under a single sense, as *e.g.* sweet and bitter, they cannot be perceived simultaneously. And similarly it can be proven that 12 things which are not opposites cannot be simultaneously perceived, for some colours partake of white and others of black and this applies equally to other sensations, *e.g.* amongst flavours certain ones have the character of sweet and others of bitter. Neither can fused objects be simultaneously perceived, for their ratios have the character of contrariety, *e.g.* the octave and the fifth, unless they are perceived as one. In this way and not 13 otherwise a single ratio of extremes is produced. For in any other case there will be produced at once the ratio of the many to the few, and of the uneven to the even, and on the other hand the ratio of the few to the many, and of the even to the uneven. If co-ordinates which 14 are specifically different, are further removed from each other and differ more than things that are specifically the same (*e.g.* sweet and white I mention as co-ordinates, but specifically different), and sweet differs from black more than white does, it would be still less possible for these opposites to be perceived simultaneously than it would be for opposites specifically the same. So that if the 15 latter are not simultaneously perceptible, neither would the former be.

In regard to the opinion of certain writers who treat the subject of harmony, and say that sounds do not

really reach us at the same moment, but only appear to
do so and we do not notice this, the time being imperceptible,
the question is whether their opinion is right or
16 not. Here, also, one might perhaps say that we only
appear to hear and see at the same time, because the
intervening time is not perceived. This is incorrect;
it is impossible for time to be imperceptible, or for us to
be unconscious of it, but every moment is perceptible.[1]
17 For when one perceives one's self or something else in
continuous time, it is impossible for one to be then
unconscious that one is; but if there is in continuous
time a moment of such duration that it is altogether
imperceptible, it is evident that one would then be
unconscious of one's own existence, or would not
know whether or not one sees and perceives. Further,
448 *b* even if one has perception, time would not exist and
there would be no object nor any moment in which
sensation should take place, unless it were in the sense
that one sees in a part of time or a part of the object, if
there is a measure of time or object, which, owing to its
smallness, is totally imperceptible. For if one sees the
entire earth, one also perceives time itself in its
continuity, and not in any of its isolated moments. Let
18 C B represent a time-division in which one has no
perception. One sees, then, in a particular part of the
whole or sees a particular part, just as one sees the
entire earth, viz. by seeing a definite part of it, and how
far one walks in a year, viz. by seeing how far one
walks in a definite part of a year. But in the division
B C there is no perception. Now, by virtue of

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[1] On the 'minimum visible' see Lewes, *Aristotle*, p. 253.

perceiving the whole A B in some definite part of it,
one is said to perceive even the entire earth. And 19
the same reasoning holds good of A C. For one always
perceives in a part and a part, and it is impossible
to perceive the entirety. And so every thing is perceptible,
but one does not see what its extent is.
For one sees the magnitude of the sun and of the
four-cubit measure from a distance; they are not
seen, however, in their real size, but sometimes they
seem indivisible, and one does not see the indivisible.
The reason for this has been stated in the foregoing. 20
One concludes from this that there is no imperceptible
time.[1]

We must take into consideration the above-mentioned
problem, whether or not it is possible to have several
simultaneous sensations. By 'simultaneous' I mean such
as are experienced in the same part of the soul and in
one indivisible moment of time. In the first place, then, 21
is it possible that the sensations be simultaneous in the
sense that they are experienced in different parts of
the soul, and not in one indivisible part, though by
parts which are indivisible in the sense of forming a
continuous whole? Or, to take first what affects the
single sense, as *e.g.* sight, shall we say that if different
colours are sensed by different parts of sight, it will
then have several parts specifically the same? For its
repeated sensations belong to the same species. But 22

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[1] Aristotle defines time (note 2, p. 183) as the measure or number of motion, but time cannot exist apart from mind, as number cannot exist apart from a calculator, and the sole calculator is mind (*Phys.* 223*a* 16 ff.).

[2] Read *ταὐτά* (supported by most of the MSS.) for *ταῦτα*.

if one says that, as in the instance of our two eyes, a certain unity and single activity is produced, so nothing prevents our regarding the soul in the same way. If, however, the combination of both forms an unit, then that which is perceived will be an unit, and if they remain uncombined, then the result will likewise be
23 uncombined. Again, the same sensations will be manifold, in the sense in which one speaks of sciences as
449a manifold. For neither is there any actuality apart from its corresponding potentiality, nor is there any sensation apart from actuality. If one does not experience simultaneously the sensations which occur in a single indivisible part of the soul, it is clear that one does not experience others simultaneously For it is simpler to perceive these several things simultaneously than it is to perceive generically different things simultaneously.
24 But if the soul senses sweet with one part and white with another part, the derivative of these two is either an unit or it is not an unit. But it must be an unit, for the perceiving organ is an unit. What is the unit, then, with which this organ is concerned? For we have no unit from sweet and white. There must, therefore, be some unitary principle in the soul, whereby it perceives things as wholes,[1] as remarked above, but things generically different are sensed by different organs. Is then
25 the principle whereby we perceive sweet and white a single organ, in so far as these qualities are united, but when they are actually isolated, is it a different

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[1] This function is ascribed to the 'common sense,' where the various experiences of the individual senses are fused into a whole or the percept. Cf. *Introduction*, Chap. iv.

organ that senses each of them? What applies to the things themselves, applies similarly to the soul. For numerically one and the same thing is white and sweet, and possesses many other qualities, unless the qualities be regarded as isolated from one another, and yet the essential nature of each quality is different. One must likewise conclude in reference to the soul that one 26
and the same principle (numerically regarded) perceives everything, although its mode of expression is different, in some cases generically different, and in others specifically different. Simultaneous sensations, therefore, are experienced in one and the same principle of the soul, but not in one and the same relation to this principle.

It is evident that every sensible object has a certain magnitude, and that it is impossible to perceive what is indivisible. There is a point from which it is im- 27
possible for one to see, viz. a point of infinite removal, but the point from which vision is possible is determinate. The same applies to the odorous and audible and to such sensations as are not tactual. There is an extreme point of remoteness from which vision is no longer possible, and a point of nearness at which vision begins. This point must be indivisible, and what is 28
beyond it is not perceptible, and what is on this side of it must be perceptible. If, indeed, an indivisible thing is perceptible, then it will follow when one places it at the extreme point from which it is no longer visible, and again at the point where perception begins, that it is simultaneously visible and invisible. And this is impossible.

449 b We[1] have now treated, in general and in particular, the subject of the organs and objects of sensation. In what remains, we must first investigate the subject of memory and of memory's process.

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[1] Bekker in the editions of Berlin (quarto) and of Oxford (octavo) transfers this paragraph to the beginning of the tractate *On Memory*. For a critical examination of the arrangement of the text *vid.* Freudenthal in *Rhein. Museum*, Vol. 24, p. 393.

ON MEMORY AND RECOLLECTION.[1]

CHAPTER I.

N regard to memory and its process, we must determine hat its nature is, by what agency it is produced, and to hat psychical organ the phenomenon of memory, as ell as that of recollection, is to be ascribed. For

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[1] Aristotle makes the following distinction between memory (μνήμη) d recollection (ἀνάμνησις): the former is the reproduction of a past perience accompanied by the consciousness that the experience has been eviously had; the latter is the deliberate reproduction of the same perience and is based on reflection. The former is possessed by the wer animals and the latter by man only. Plato had already made a stinction between memory and recollection (*Phaedo*, 73 B ff., *hilebus*, 34 B). The passive presence of residual sensations in the soul memory, while their active recall to consciousness is recollection. In e *Meno* the whole of knowledge is resolved into recollection or miniscence (ἀνάμνησις), learning being only the stimulation or revival knowledge congenitally in us. In a note which Grote meant to be ded (directions to this effect are recorded in the MS.) to Chap. XX. his *Plato and the Other Companions of Sokrates*, he says: "The ctrine of Reminiscence declared and illustrated by Sokrates in the atonic Menon (πᾶσα μάθησις ἀνάμνησις) bears much analogy to the velopment-Hypothesis espoused by Mr. Herbert Spencer; an extension d special application of the large views opened by Mr. Darwin respect- g the origin of species. Each individual animal is assumed to begin

the same persons are not endowed with good memory and good recollection, but as a rule phlegmatic natures remember well, while the quick and ready-witted are
2 apt at recollection.

First of all we must grasp what is understood by the object of memory. For one is often mistaken about this. The future cannot be the object of memory; this is rather the object of conjecture and expectation (and we might even have a science of expectation, as some describe the subject of prophecy). Neither can the present be its subject-matter, for our senses are concerned with this. By sensation we do not have cognizance either of the future or of the past, but only of the
3 present. Memory, on the other hand, regards the past. No person would say that he remembers the present while[1] it is present, *e.g.* that he remembers seeing the white object while he sees it; neither does one remember the object of contemplation, so long as the act of contemplation and thought continues. But one merely says that in the former case one sees, and, in the latter, one knows. When, however, one possesses knowledge or sensation which is not in actuality, then one remembers that the angles of a triangle are equal to two right angles, because one has learned it or thought it out, or, on the other

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existence with a large stock of congenital predispositions and aptitudes engrained in its nervous system as the result of an 'infinitude of past experiences'—not indeed of its own but of its progenitors. Hence arise all its instincts, and many of its mental combinations which go beyond instinct. See Mr. Spencer's Psychology, pp. 577-583-619." Extract from the MSS. of "Grote's Papers" in the Bodleian Library, Oxford (MS. add. D. 85, p. 37).

[1] Read *ὅτε* for *ὅτι*.

rely heard it or visually observed it, or found
such way. For when memory actually takes
st say that the process in the soul is such
nerly heard, perceived, or thought the thing.
, memory is neither sensation nor conceptual 4
it is the condition or modified form of one
r the lapse of time. There is no memory of
n the present moment, as we have said, but
eption of the present, expectation of the
memory of the past. Consequently, all
ssociated with time. Therefore, only those
t have perception of time, have memory,
y attaches to that organ whereby time
[1] Now we have already discussed imagin- 5
treatise *On the Soul*[2] and we concluded
ought is impossible without an image. For
thought the same conditions as in drawing 450*a*
the latter without needing a triangle of a
nitude, we nevertheless draw a triangle of
So, too, the thinking mind, even if it does
magnitude, still places a quantitative body
es, although it does not think it as such. If 6
ure of the quantitative in an indefinite sense
he mind is concerned, then thought represents
form of a definite quantity, but thinks it
antity. The reason why it is impossible to
ing apart from continuity (even things that
ect to the laws of time cannot be thought

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f memory and the organ whereby we perceive time is the
r heart (451*a* 17).

27*b* 14 ff. ; 434*a* ff.; 431*a* 17.

without time[1]) is a problem that belongs elsewhere.[2] We must be conscious of magnitude and motion[3] by the same faculty whereby we are conscious of time. An 7 image is a product of sensation in general. Evidently, therefore, the cognition of these things is to be ascribed to the primary power of sense. Memory, even the memory of concepts, does not take place without an image. Consequently, memory concerns the faculty of thought accidentally and the primary power of sense intrinsically.[4] It is, therefore, possessed by other animals, and is not peculiar to man and creatures endowed with opinion 8 and thought. If it were a property belonging to the conceptual powers, it would not be found in many animals outside of man, perhaps in none of the brutes, seeing that they do not, as a matter of fact, possess it because they all lack the sense of time. For in an activity of memory, as we remarked before, there is always the additional consciousness that one has seen or 9 heard or learned this in time past. Prior and later are properties of time. In reply to the question to what part of the soul memory is to be ascribed, it is plain that it belongs to the same part as imagination. The objects of

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[1] Aristotle is referring probably to the heavenly bodies and their eternal laws.

[2] Topics of this kind Aristotle refers to the First Philosophy or Metaphysics.

[3] Magnitude and motion are classified by Aristotle amongst the 'common sensibles' and as such they are perceived by the 'common sense' whose organ is the heart.

[4] In other words memory is a revived sense-experience and is due to the direct function of the primary organ of sense (the heart); it concerns the faculty of thought only accidentally, viz. in furnishing it with images which are converted into concepts that are essentially different from images.

memory, intrinsically, are the same as the objects of
imagination; accidentally, they are such objects as are
impossible without imagination.[1]

The question might be asked: How in the world is
it that while a mental impression persists, although the
thing itself is no longer at hand, one remembers what is
not present? Evidently we must regard this phenomenon 10
which through the mediation of sensation is produced in
the soul and in that part of the body[2] which possesses
sensation (whose persistence we call memory), as similar
to a painting. For an active stimulus stamps on the soul
a sort of imprint of the sensation, analogous to stamping
with a seal-ring. For this reason, too, persons who are 11
deeply moved by passion or by the ardour of youth do 450*b*
not remember, just as if the effort and the seal were
applied to running water. In other persons, because of
their worn-out condition, like old buildings, or because
of the hardness of their receptive principle, no impression
is made. Consequently, the very young and the aged have 12
poor memories. For the former are in a fluent condition
owing to their growth, and the latter are unstable owing
to their decay.[3] Likewise the excessively quick and the
excessively slow seem to have poor memories. The

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[1] When the objects of imagination are recognized as past experiences or copies of past sensations they are called memories. They are, therefore, in their essential nature or intrinsically the same as the objects of imagination. Objects of memory in an accidental sense are, perhaps, such elements as do not attach to the image as such, but are not possible without it, *e.g.* the circumstance that Coriscus (who is the image proper) was a native of Scepsis.

[2] Namely, in the heart.

[3] It is this passage which Reid distorts in his review of Aristotle's theory of memory. Cf. *Works*, ed. Hamilton, p. 353.

former are too moist and the latter too hard. Consequently, the image does not last in the souls of the 13 former, and in the latter it does not fasten. If such is the truth regarding memory, the question arises whether one remembers the impression or the thing from which the impression was derived. For if it is this impression of ours which is the object of memory, then we do not remember what is absent. On the other hand, if it is the thing that we remember, how does it come that while we perceive this impression we remember what we do not perceive, viz. the absent thing?[1] And if memory is analogous to an imprint or picture within us, why should the perception of precisely this thing be the memory of something else, and not the memory of just this picture? 14 For it is this impression which one contemplates and perceives in actual memory. In what sense then does one remember what is not present? It would then be possible to see and to hear what is not present. Or is there a sense in which this is possible and in which it 15 actually occurs? For example, the animal in a picture is both animal and a copy, and both of these are one and the same thing; but the mode of existence in the two instances is different, and it is possible to regard this picture both in the sense of animal and in the sense of image, and so it is with the image within us: we must regard it both as something in itself and as the image of something else. In so far as we regard it in its own

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[1] Aristotle explains further down (450*b* 30) that the image is not only a thing in itself which we have actually in consciousness, but it is also representative of the external and absent thing, which, though not in consciousness, is thus mediately or representatively remembered.

nature, it is an idea or a mental representation; in so far
as we regard it as belonging to something else, it is a copy 16
or a memory. When, therefore, an actual stimulation of
this image takes place, and when the soul perceives it in
its own nature, it appears to come to expression as an idea
or a phantasm; if however the soul regards it as belonging
to something else, then, as in the case of a painting, the
soul contemplates it as a copy and as the picture of
Coriscus, without having ever seen him. The points
of view here and in the case of our regarding a painted
animal merely as an animal are different: what arises in
the soul in the latter case is purely a thought; in the 451*a*
former case, because the object is there regarded as an
image, it appears as a memory. And, consequently, there 17
are times when we do not know, regarding such psychical
processes due to earlier sensations, whether they are
produced by sense-experience, and we are in doubt
whether they are a memory or not.[1] At another time it
happens we think and recall that we have heard or
known the thing in the past. This takes place when 18
after contemplating a thing in its own nature, one shifts
one's position and regards it as the copy of another thing.
The converse of this also happens, as is shown by the
case of Antipheron of Oreos and other ecstatics. For they
asserted that their phantasms were real, and that they

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[1] It is often difficult to decide whether certain apparent memories are merely fictions of imagination or actual past experiences, because imagination is not merely reproductive (*αἰσθητική*) but productive (*λογιστική*). It is, however, impossible to have an unconscious memory. So long as one is not conscious that a given experience or image has been had before, the thing is only a phantasm (*φάντασμα*) and not a memory (*μνημόνευμα*). Cf. 452*b* 26.

remembered the things. This phenomenon occurs when
19 one regards as a copy that which is not a copy. Exercise in repeatedly recalling a thing strengthens the memory. This, however, is nothing more nor less than the frequent contemplation of a thing as a copy and not as an object in itself. The nature of memory and of its process has now been explained as the persistent possession of an image, in the sense of a copy of the thing to which the image refers, and it has been further explained to what faculty in us this belongs, viz. to the primary power of sensation, and to that organ whereby we perceive time.

CHAPTER II.

THE subject of recollection remains to be treated. First
of all we must take as presuppositions the truths which
were established in the treatise *On Argumentation.*[1]
Accordingly, recollection is neither the recovery nor 2
acquirement of a memory. For when one learns or
acquires an impression for the first time, one does not
recover any memory (for none has preceded), nor does
one acquire an initial memory. But when a persistent
mental condition and impression is fixed in the soul, then
we have memory. Consequently, memory is not produced
simultaneously with the production of an impression.
Further, in the indivisible complete moment when the 3
impression is first received, the impression and the know-
ledge are recorded in the affected subject, if one can call
this mental condition and impression, knowledge, (and

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[1] Themistius and Michael Ephesius think the reference is to the *Problemata.* Bonitz, however, considers it more probable that Aristotle is referring to the *ἀπορίαι* discussed in Ch. I. of the present tractate. Cf. Index to Bekker's Berlin edition *sub. voc.* Ἀριστοτέλης, 99*a* 38. If the latter supposition is correct, one will have to give the words *λόγοι ἐπιχειρηματικοί* the unusual meaning of *Initial Treatise,* which, however, they might perhaps bear.

there is nothing to prevent our remembering, in the sense
of accident, a certain thing which we know conceptually).
But memory as such is not possible until after the lapse of
time. For what we remember now, we have previously
known or experienced, but what we experience now is
4 not in the present moment remembered. Further, it is
451 *b* evidently possible to have in memory what we do not
now recollect, but what was once perceived or experienced.
When one re-acquires knowledge or sensation (or whatever
the mental possession be to which we apply the term
memory), it is then that one recollects one of the afore-
5 said mental possessions. The process of memory takes
place, and memory ensues. Neither do the phenomena
of recollection, if their occurrence is the repetition of a
previous recollection, follow absolutely the same order,
but sometimes they occur in one way and sometimes in
another.[1] It is possible for the same individual to learn
and discover the same thing twice. Recollection, then,
must differ from learning and discovery, and there is
need of greater initial latitude here than is the case with
learning.[2]

6 Recollection is effected, when one suggestion succeeds another in natural order. If the succession is a necessary one, it is plain that when the antecedent suggestion is given, it will excite the succeeding one. If, however, the

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[1] A given association may at one time awaken a recollection and at another time fail to do so (cf. 452*b* 1 ff.).

[2] In the case of learning and discovery there is a definite and exact process by which a given result may be twice arrived at. In the case of recollection, on the other hand, there is not the same fixity of procedure. There are not only many forms of suggestion and association, but a given suggestion may not effect the same result in two instances.

succession is not a necessary one, but only customary, the recollection will be stirred generally. But it is a fact 7 that some persons by being impressed only once are trained[1] in a given way more than others after frequent impressions. And so there are some things which after we have seen once, we remember better than others do who have seen them frequently. When, therefore, we recollect, we awaken certain antecedent processes and continue this until we call up that particular experience, after which the desired one is wont to appear. That is 8 the reason why we hunt through a series in thought, beginning with an object presently before us, or with something else, or with an object that is similar, or opposite, or contiguous.[2] In this way, recollection is awakened. For mental movements in these instances are identical in some cases, in others simultaneous with, the desired experience, and in other cases they involve a portion of it, so that there is a small remainder whose stimulation ensues. This then, is the way in which people try to recollect, and without 9 conscious effort they recollect in this way, when the desired experience is recalled as the sequence of another experience. For the most part, however, the desired experience is recalled only after several different suggestions, such as we have described, have preceded.

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[1] 'Trained' (ἐθισθῆναι) means here the acquisition of a fixed habit (ἔθος) or disposition. In the case of other persons, impressions do not produce a fixed disposition, but are evanescent. Consequently in the latter, a suggestion is ineffective, while it results in recollection in those persons where the impression has become a fixity or habit.

[2] The laws of association, ordinarily treated as contiguity and similarity, are here stated by Aristotle as similarity, contrast, and contiguity.

One does not at all need to look at the remote and ask
how we remember it, but at what lies near before us.
For the same method applies to both cases,—I mean the
method of sequences,[1] without any prior effort to find
this sequence and without recalling it. For mental
10 movements follow one another, this one after that,
by habituation. When a person wants to recall a thing,
he will do the following: he will try to gain a starting-point in the process, in sequence to which the desired
experience was had. Consequently, recollections which
are awakened from the starting-point are most quickly
452 a. and best effected. For just as things are mutually
related in their order of succession, so also are the
11 mental processes. And such things as have a fixed
order are easily remembered, as *e.g.* mathematical truths.
Other things are remembered poorly[2] and with difficulty.
Recollection differs from re-learning in this, that there
can be in the former case a sort of self-movement back
to that which follows upon the original experience.
When this is not done, but the recollection is prompted
12 by another person, then it is no longer memory. Oftentimes one is unable to recollect a thing, but after searching
succeeds in finding it. This seeking and finding is what
happens when one awakens a number of experiences and
continues to do so until one sets that particular experience in motion upon which the desired thing is attendant.
Memory is the possession of an experience potentially

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[1] This series of sequences is compared by Themistius to a chain, in which if one link be lifted the next will likewise be moved and so on. Cf. Sir William Hamilton's note in Reid's *Works*, p. 894.

[2] Read φαύλως καὶ for φαῦλα.

revivable. This process is effected, as was said above, in
such way that it comes from the person's own effort and
from the movements in his power. One must, however, 13
have a starting-point. And so persons appear sometimes
to recall things from local[1] suggestions. The reason is
that one passes rapidly from one thing to another, *e.g.*
from milk to the suggested idea of white, from white to
air, from air to the moist, and from this one recalls the
late autumn, which is the season one was trying to think
of. In general, it is the middle, too, of the entire series 14
that seems to be the starting-point for memory. For
when a person does not remember earlier, then he does so
when he comes to the middle point, or when he does not
remember here, then at no other point at all, as is the
case *e.g.* when one passes through the series *ABCDEFGH*.[2]
If one does not remember at *H*, one remembers
when one comes to *E*, provided one is in quest of *F* or *G*.
For from that point the movement of suggestion is
possible in both directions, towards the point *D* as well
as towards the point *F*.[3] If, however, a person is not in 15
quest of one of these, he will remember on reaching *C*, and

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[1] There is no reason for adopting the conjecture of Sir William Hamilton (*ἄτοπα* for ἀπὸ τόπων 452*a* 13), which Barthélemy-Saint-Hilaire (Commentary, *ad loc.*) considers necessary and which Hamilton characterises as "absolutely certain" (Reid's *Works*, p. 905 *note*).

[2] Freudenthal (*Rhein. Museum*, xxiv. p. 410) thinks we have here a defective text, because in a series of eight elements there is no middle term. It seems, however, hopeless to get anything satisfactory out of the illustration by emendation or reconstruction.

[3] *Vid.* Freudenthal's explanation in the *Archiv fur Geschichte der Philosophie* (vol. ii. p. 2) and Siebeck's in his *Untersuchungen zur Philos. der Griechen* (2te Aufl. p. 155). Sir William Hamilton simply distorts the text beyond recognition in order to obtain an intelligible translation, and even then achieves but a meagre success in his aim.

if not then, he will remember on reaching *A*, and this is the case always. But from the same point of suggestion one sometimes remembers and sometimes does not, the reason for which lies in the possibility of movement in more than one direction from the initial point, *e.g.* from *E*
16 to *F* or from *E* to *D*. If the movement is influenced by an old suggestion, it takes place in the direction of the more fixed habit.[1] For habit is second nature. Consequently, we remember easily what we often ponder. For as one definite thing succeeds another in nature, so it
17 is also in our activity. Frequent repetition produces nature. Since we find in the realm of nature occurrences
452*b* that violate her laws and are due to chance, much more do we find this in the realm of custom, to which the term nature cannot be applied in the same sense. The consequence is that a movement here sometimes takes place in one direction and sometimes in another, especially when the mind is distracted from a particular point to
18 something else. Therefore, when one has to remember a name, and remembers one like it, one commits a solecism in regard to it. This then is the way in which recollection takes place.[2]

The most important thing here is the necessity of appreciating time, whether in a determinate or an in-
19 determinate form. There must be some power whereby we distinguish a longer from a shorter interval. It is natural that the same conditions which apply to magnitudes, apply here also. For we think what is large and what is remote in space, not because thought extends to

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[1] *Vid.* Sully, *The Human Mind*, Vol. I. p. 201.

[2] Namely, through the association of ideas.

given point, as some say[1] in their explanation of ›n (for we can think the non-existent as well as the tent), but because of an analogous process in the d. For the figures and processes that correspond to gs are in the mind itself. What difference will it 20 :e, then, whether one thinks what is larger, or the other ı of things that are smaller? For all the internal ıents are smaller, and the external have, as it were, a ›ortional magnitude to them. It is perhaps in the of distances in space just as it is with figures, one to assume the possession of another analogous figure he mind itself. So, *e.g.* if one draws the lines *AB* and 21 one produces *CD*, for *AC* and *CD* are proportional. y does this produce the line *CD* rather than *FG*? s this due to the fact that as *AF* is to *AB*, so *H* is to For these lines are drawn at the same time. And ne wants to think the line *FG*, one thinks similarly line *BE*, and instead of *HI* one thinks *KL*. For e are related to each other as *FA* to *BA*.[2]

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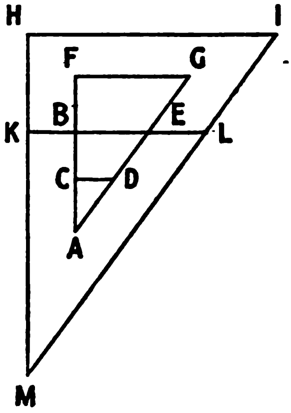
[1] ›mpedocles.

[2] reudenthal (*Rhein. Museum*, Vol. ›. 416) attempts to elucidate this lessly difficult passage by the e:



this figure Freudenthal makes *AB*, represent sense-impressions; *AF*, ›xternal objects; *AC*, *CD*, notions ›ncepts; *MH*, *HI*, time objectively ›ded; *MK*, *KL*, time subjectively ›ded. Consequently, so he goes on ›xplain: $\frac{AB}{BE}=\frac{AC}{CD}=\frac{AF}{FG}$ means that ›ntations of sense or images of *ασla* are related to each other as the

22 When the suggestion of the thing and the suggestion of
time coincide, we have actual memory. When, however, one
believes one does this without really doing it, one only
believes that one remembers. For there is nothing to
prevent one's being deceived and fancying that one
remembers without this being actually the case. In
actually remembering it is impossible that one should
not believe one is remembering, but should be uncon-
scious of it. For this is just what constitutes memory.
If, however, the suggestion of the thing and the sug-
gestion of time are separated from each other, then no
memory is awakened. The suggestion of time has a two-
fold meaning. Sometimes a thing is not remembered
in determinate time, *e.g.* that day before yesterday one
453 *a* did something or other; in other instances one remembers
in terms of time-measure. Memory, however, takes
place even if one does not remember in the latter way.
24 People are wont to say that they remember, although they
do not know just when a thing happened, in cases where
they are ignorant of the determinate measure of the
When.

We have already said that the same individuals are
not endowed with good memory and good recollection.
25 Recollection differs from memory not merely in the time-
element, but also because many animals share the endow-
ment of memory, while none of the known animals, one

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corresponding notions. $\frac{AB}{BE}=\frac{AF}{FH}$ signifies that presentations of sense are related to each other and the corresponding external objects are related to each other. $\frac{AF}{AB}=\frac{H}{M}$ or $\frac{FG}{BE}=\frac{HI}{KL}$ signifies that external objects are related to their sense-impressions as objective time to subjective time.

may say, excepting man, is endowed with recollection. The reason for this is that recollection is a sort of syllogistic process. 26 In recollection one reasons that one has known or heard or had some such experience of the thing in question, and the process is a sort of inquiry.[1] And this is naturally found only in those creatures which have the power of deliberation, and deliberation is a kind of syllogistic procedure.

27 That this condition affects the body, and that recollection is the search for an image in a corporeal organ,[2] is proved by the fact that many persons are made very restless when they cannot recall a thing, and when quite inhibiting[3] their thought, and no longer trying to remember, they do recollect nevertheless, as is especially true of the melancholic. For such persons are most moved by images. 28 The reason why recollection does not lie within our power is this: just as a person who has thrown an object can no longer bring it to rest, so too one who recollects and goes in search of a thing, sets a corporeal something in motion, in which the desired experience resides. 29 Especially disturbed are such persons as have moisture about the region of sensation; for they do not easily come to rest after being stirred into motion, until they attain the thing sought for, or the movement has taken its proper course. Consequently, the feelings of anger and

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[1] In intentional recollection one employs the laws of association deliberately and through reflection; in spontaneous recollection the same laws apply, but are not deliberately employed.

[2] In recollection the organic process is from within to the organs of sense, while in sensation the process is from the periphery to the centre (*De an.* 408*b* 17).

[3] Read, *καὶ πάνυ ἐπέχοντας*, 453*a* 17.

fear, when they once set up a movement, do not cease
although opposing movements are started against them,
30 but on the contrary persist towards their own aim.
This affection resembles names, melodies, and words, when
these are given violent utterance. For after one has
31 ceased, the singing or speaking recurs involuntarily.
Further, those whose upper body is too large, and also
453 *b* dwarfish persons, have less power of recollection than those
of the opposite physical structure, because the former are
too heavy about the organs of sensation, and because the
initial movements cannot persist but are destroyed, and
direct movement in the process of recollection cannot
32 readily take place. Also the exceedingly young and the
very old do not recollect well on account of their movement; for the latter are in decline, and the former in
rapid growth. Furthermore, children are like dwarfs
until they advance in age.

We have now treated the subject of memory and its process, its nature and the psychical organ whereby animals remember; also the subject of recollection, in its nature, its forms, and its causes.

ON SLEEPING AND WAKING.

CHAPTER I.

WE must now consider the subject of sleeping and waking, and ask what they are and whether they are phenomena peculiar to the soul or common to the body[1] and the soul, and if they are common, we must further inquire to what particular organs of the soul and body they belong. Further, we must inquire to what cause this animal function is due and whether all animals share in both sleeping and waking. Or are certain animals endowed with the one, and others exclusively with the other, or are there creatures that are endowed with neither of them, and others with both? In addition to this we must investigate the nature of dreams and explain why persons sometimes dream[2] in sleep and at other times do not. Or shall we say that dreaming always occurs in sleep,

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[1] Aristotle had himself stated the mixed physiological and psychological character of these opuscules in referring to their subject matter as *κοινὰ τῆς ψυχῆς καὶ σώματος* (436*a* 7). See also note, 1, p. 145.

[2] The subject of Dreams and Prophecy by Dreams is specially treated in separate opuscules. *Vid.* pp. 231 ff., 247 ff.

but we do not remember our dreams? If this is true,
what is the explanation? A further question is whether
or not it is possible to foresee future events, and if it is
possible, in what sense are they foreseen? Further, is it
possible to foresee only such future events as are performed
by man or also such as are caused by divine
power, and does this foresight apply to what takes place
in the course of nature or to the results of accident?
2 First of all it is evident that both sleeping and waking
are to be ascribed to the same organ, for they are contrary
functions, and sleep is clearly the negative of waking.
Now contraries, whether in the realm of nature or elsewhere,
are always expressed in one and the same organ
capable of receiving them and are affections of the same
thing, I mean *e.g.* health and disease, beauty and ugliness,
strength and weakness, sight and blindness, hearing and
454*a* deafness. This is further evident from the following: it
3 is by the same sign that we recognise a person awake
and one asleep. For when a person has sensation we
regard him as awake and we believe that every waking
person has sensation to a certain extent either of the
4 external world or of internal processes. If, then, waking
consists in nothing else than in having sensation, it is
evident that by virtue of that organ wherewith one has
sensation, waking creatures are awake and sleeping
5 creatures are asleep. But since sensation is not the
function exclusively either of the soul or the body (for
where there is potentiality there is also a corresponding
actuality; but what we understand by sensation in its actual
sense, is a psychical process mediated by the body), it is
plain that this phenomenon does not belong exclusively

to the soul, and on the other hand it is impossible for an inanimate body to experience sensation.[1] In earlier 6 treatises[2] we have analysed the parts of the soul as we call them, and explained that the nutritive part is different from the other powers in animate bodies, although no other power can exist independently of it. From this it is evident that such living creatures as are endowed only with the functions of growth and decay, do not experience sleeping or waking, as *e.g.* plants. For they have no organ of sensation, whether separated from or conjoined with the organ of nutrition;—in potentiality and mode of expression these two organs are separable from one another. It is likewise true that there is no 7 creature that continuously wakes or continuously sleeps, but both these conditions are found in the same animals. If an animal has sensation, it is impossible that it should not sleep and wake. Both these phenomena refer to the experience of the primary organ of sensation.[3] It is impossible that either of these conditions should be 8 continuously found in the same creature, *e.g.* that any species of animal should sleep or wake constantly, because whenever we find a natural function, as soon as the time is exceeded during which the function is capable of being exercised, the organ necessarily becomes impotent, just as the eye by exercising vision becomes unable to

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[1] *'Αισθάνομαι* signifies consciousness as well as the physiological process of sensation.

[2] Cf. *De an.* 415*a* 23 ff.; 432*a* 23 ff.; 434*a* 22 ff.

[3] Namely, the heart. Plants have no central organ (*De an.* 411*b* 19), which is necessary to sensation, and without the latter they cannot be said to sleep or wake, sleeping and waking being respectively the activity and quiescence of sensation.

CHAPTER II.

WE must now inquire why it is that sleeping and waking occur, and to what sense, or senses, if there are
2 several, they are due. Since some animals have all the senses and others not, *e.g.* some do not have sight, whereas touch and taste are universal excepting in cases of abnormal creatures (and mention has made of these in the treatise *On the Soul*[1]), and further, since it is impossible for an animal in sleep to experience any sensation whatever, it is clear that we shall necessarily find this condition in all the senses during what we call sleep. For if an animal were to sleep in one part and not in another, then it would have sensation in sleep, which
3 is impossible. Now, in every sense there is a power which is peculiar to it and another power which it has in common with others, *e.g.* vision is peculiar to the eye, audition to the ear, and, similarly, peculiar powers belong to the other senses. But there is also a kind of common power that is associated with all the particular senses, by virtue of which one is conscious that one

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[1] *De an.* 425*a* 10; 432*b* 23; 433*b* 31.

sees and hears. For by means of sight one does not perceive that one sees, and one discriminates and has 4 the power of discrimination between sweet and white, not by virtue of taste or sight, nor by means of the two combined, but by means of a certain power which is common to all the sense-organs. For sensation is unitary and the master-organ of sensation is unitary, although there is an essentially different character that belongs to each category of sensation, *e.g.* to sound and colour. This common element[1] is allied more nearly to 5 the tactual than to any other sense. For the tactual can exist apart from all the other sense-organs, but the others cannot exist apart from it. This, however, was discussed in the studies *On the Soul.*[2] Sleeping and waking, then, are evidently an affection of this common sense, and are consequently found in all animals. For touch is the 6 only universal sense. Now, if sleep consisted in the fact that all the senses undergo something, then it is remarkable that in cases where it is not necessary, or in a certain sense not possible, for them to be simultaneously active, yet these same senses should become simultaneously inactive and immobile. On the contrary, it is more plausible to suppose that they are not at rest simultaneously. But the explanation that we have given of 7 these phenomena is a rational one. For when the master-organ that rules over all the others and to which all the

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[1] The function of consciousness is ascribed to the central or common sense, whose organ, in common with that of touch, is the heart (*De sensu* 438*b* 30, 469*a* 12). The following sentence, in the text, does not mean that the common sense can exist apart from the special senses, but that both touch and the common sense are necessary to the others.

[2] *De an.* 413*b* 32 ff.; 434*b* 23. *Vid.* also *De juvent.* 467*b* 28 ff.

455 *b* others are directed, is affected, all the subordinate organs
are necessarily affected with it; on the other hand, when
one of the latter is disabled it is not necessary that the
8 master-organ should be disabled also. But it is evident
from many considerations that sleep does not consist in
the inactivity and non-use of these special senses, nor in
their incapacity to experience sensation. For this is just
the sort of thing that happens in swooning: swooning is
the exhaustion of the senses. And there are also certain
other kinds of mental disturbances that resemble this.
Also, by compressing the jugular vein, one loses
9 sensation. But whenever there is a loss of the use of
sensation, it does not find its explanation in any chance
sense nor is it attributable to any haphazard cause, but
the explanation is found, as we just now said, in the
primary organ of all sensation. For when this is
disabled, all the other sense-organs are also necessarily
unable to have sensations. When, however, one of
these latter loses the power to act, the common sense
is not necessarily disabled.

We must inquire to what cause sleep is due, and what
10 sort of an affection it is. Now there are several kinds
of cause[1] (for we speak of cause in the sense of the

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[1] Aristotle views the world under the aspect of processes dominated by two causal principles—form and matter. He conceives of the latter as potentiality, which in a world of movement passes over into a condition of actuality. Actuality is synonymous with form. In organic processes these two things are separable only in abstraction. Form represents the completed condition towards which matter strives. Form is therefore the end, or otherwise expressed, the final cause. Further, as the completed notion of a thing, or that which a thing really and finally is, it is the essential or notional cause. The definition of a thing is its notional cause. Cause (*αἰτία*) is here, of course, employed in a sense foreign to English usage. There is no idea of

end or purpose; again as the principle of motion, as the material condition, and as the notion or form). First of all, then, when we say that nature acts with a purpose, we mean that this purpose is some good, that rest is provided for every creature whose nature it is to move, and that, being incapable of constant and continuous pleasurable movement, this rest is a necessary 11
and useful thing (and the metaphorical term 'rest' is with perfect accuracy applied to sleep as repose). Consequently, sleep exists for the preservation of animals, and the waking state is its final cause and purpose. For 12
sensation and thought are the final purpose of all animals that possess either of these powers. These are their highest activities, and the highest is the end. Sleep, therefore, is a necessity for every animal. I mean here a hypothetical necessity, viz. that if an 13
animal is to preserve its nature, it must necessarily be provided with certain things, and where these things are found, other things are involved. We must next ask to what sort of bodily process and activity waking

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agency in it, as there is in all English meanings of cause. It signifies, rather, 'principle.' Further, form represents the inner *Trieb* or force in matter whereby it is in constant transition towards the realisation of its end. In this sense form is the efficient or moving cause. We have then form used in the various senses of (1) final principle, (2) notional principle (*i.e.* the notion or significance of a thing), and (3) the efficient principle. The first and third are conceived of as forces or causal agents, while the second is cause in the sense of being the source from which these forces issue. The two ultimate principles, then, which Aristotle employs for the explanation of all reality and all developments are:

1. Form (the essential thing). 2. Matter (material condition).
    (*a*) End or final cause.
    (*b*) Motion or efficient cause.

and sleeping are due. We must assume that the causes of sleeping and waking are the same or analogous in bloodless and sanguineous animals, and in the lower sanguineous animals and man. So that what we observe in the case of man, we shall have to apply to them all.

34 It has been already determined in other treatises that 456 a the origin of sensation is found in the same organ from which motion originates. This organ is found in the middle division[1] of the three topical sections of the body, and lies between the head and lower body. In sanguineous animals it is the pericardiac section, for all sanguineous animals have a heart, and this is the 5 primary source of motion, and of the higher sensation.[2] Evidently the origin of movement and of breathing, and in general of refrigeration, is found in this section, and it is also evident that nature created the organs of respiration and of refrigeration, which latter is effected by means of moisture, for the purpose of maintaining the warmth in this part.[3] But this subject will receive 10 separate treatment later.[4] On the other hand, in the bloodless animals, the insects, and such animals as are incapable of breathing air, there is found in an organ corresponding to the lungs congenital air which rises and falls. This is evidently true in the case of insects with undivided wings, such as wasps and

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[1] Thorax.

[2] The "higher sensation" appears to mean sense-perception or the apprehension of the "common sensibles." Cf. Introduction (chap. iv.) on the nature and function of the "common sense."

[3] That is, for the purpose of maintaining *normal* animal heat, and for guarding against its excess.

[4] *Vid.* the tractate *On Respiration.*

bees, also in flies and similar insects. But since it 17
is impossible to originate motion without power, the
retention of the breath generates power—breath derived
from without in the case of respiring creatures, and congenital
breath in the case of non-respiring animals (this
is the reason why, as we see, winged insects buzz when
in motion, the sound being caused by the friction of the
air striking on the diaphragm of these holoptera). Every 18
creature experiences movement whenever a sensation,
whether its own or caused from without, is awakened in
the primary organ of sensation.[1] Now, if sleeping and
waking are affections of this organ, it is clear in what
region and in what ultimate organ, sleeping and waking
have their origin. There are persons who are subject 19
to movements in sleep, and do many acts that belong to
the waking state, and nevertheless without any image
or sensation. For the dream is in a certain way a
sense-perception. About this we must speak later.
Why it is that we remember our dreams on waking,
while we do not remember acts done in a waking state,
has been explained in the *Problems*.[2]

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[1] Motion (κίνησις) is employed by Aristotle in several senses. He not only constantly speaks of intellectual processes as motions, but refers to movement in space as motion. The generic term is κίνησις, which has the following varieties (*Metaph.* 1069*b* 9; *De an.* 406*a* 12, 432*b* 9): (1) Quantitative motion, or motion in reference to magnitude (κατὰ μέγεθος), which signifies increase and decrease (αὔξησις καὶ φθίσις); (2) Qualitative motion (κατὰ τὸ ποιόν), or transformation (ἀλλοίωσις); (3) Spatial motion or locomotion (κατὰ τὸ ποῦ, called φορά); (4) Substantial change (μεταβολὴ κατ' οὐσίαν), or birth and destruction (γένεσις καὶ φθορά). Aristotle declares, however, that the last named (*Phys.* 225*a* 26, 225*b* 10) is not a proper form of motion, on the ground that the non-existent cannot be said to experience motion.

[2] The explanation here referred to is not found in the extant *Problems*.

CHAPTER III.

FOLLOWING upon what has been said, we have to consider
to what occurrences the phenomenon of sleeping and
2 waking is due and what is its origin. Now, it is plain
that as soon as an animal has sensation, it must at once
take nourishment and grow; food in its final state is,
in all sanguineous animals, blood, and in bloodless animals
456 *b* something analogous to blood. The blood is contained in
the veins, the origin of which is found in the heart (a
3 fact which is demonstrated by dissection). When food
has been introduced from without into those parts
intended for its reception, an evaporation takes place in
its transmission into the veins, and here it is transformed
4 into blood and is carried to its main organ. This subject
was discussed in the treatise *On Food*.[1] But we must
resume it now for the sake of observing the origins of
animal movement and of seeing to what affection of the
5 organ of sensation waking and sleeping are due. For
sleep is not any random exhaustion of the power of

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[1] The work *On Food* (περὶ τροφῆς) appears to be referred to in *De an.* 416*b* 31, but whether or not it was actually written is uncertain. It is not in the present *Corpus* of Aristotle's writings.

sensation, as said above. Senselessness, choking, and swooning produce a similar exhaustion. And in some cases of swooning there has been found even a strong power of imagination. Now this creates a problem. 6
For if it is possible for a swooning person to fall asleep, then this imagination might be regarded as a dream. Also, people often talk when they are in a deep swoon and are to all appearances dead. To all these cases of swooning, however, we must suppose that the same explanation applies. But, as we have said, sleep 7
cannot be any and every incapacity to feel sensation; on the contrary this particular condition springs from the evaporation of food. For the evaporation must be thrown off to a certain extent, and then it must return and change again, like the ebb and flood of a shifting strait. 8
All animal heat tends to rise; when, however, it reaches the upper parts, it turns about and courses down again in mass. Consequently, sleep is most easily produced after taking food. For a large quantity of moist crass 9
matter is then carried to the upper parts. This by remaining there produces heaviness and causes one to fall asleep. But when it descends and in turning throws off its heat, then sleep ensues and the animal slumbers. A proof of this is furnished by the action of narcotics; for they all, whether liquid or solid, produce heaviness, *e.g.* the poppy, mandrake, wine, and bearded darnel. And those who droop their heads and nod into 10
slumber appear to be in this heavy condition; they cannot lift their heads or eyelids. Sleep of this sort follows mostly on the taking of food. For there is then a strong evaporation from food. It further arises from

certain fatiguing efforts. For fatigue tends to waste, and
457 *a* waste-matter is like indigested food, when it is not cold.
11 Certain diseases, such as are due to an excessive amount
of moisture or heat, produce this effect of sleep, as is the
case, *e.g.* in fever and lethargy. Further, early infancy
produces it; for children sleep a great deal because all
12 their food rises to the upper parts. A proof of this is
seen in the excessive growth of the upper parts in proportion
to the lower ones in early childhood, due to the fact
that growth tends in that direction. It is to this cause
also that epileptic conditions are due. For sleep is similar
to epilepsy, in fact is epilepsy in a certain sense. And
13 so the beginning of this condition in many cases happens
during sleep, and while asleep persons have an attack of
it, but not while awake. For when a great mass of
fumes is carried to the upper parts, in descending they
press on the veins and produce constriction of the passage
14 through which respiration takes place. Consequently,
wine is not good for children or for wet-nurses (for it
makes no difference, perhaps, whether the wine is
taken by the children or by the nurses), but they
should drink it thinned with water and in small quantities.
For wine contains spirituous fumes, especially
15 wine of dark colour. In children the upper parts
become so full of food, that during five months of life
they cannot turn their necks. For a great quantity of
moisture rises to the upper parts, just as it does in the
case of persons who are very drunk. This phenomenon
suggests a rational explanation of the fact that the
16 embryo remains at first quiet in the womb. Also, in
general, persons with deep lying veins, of dwarf-like

structure, and with large heads, are given to sleep. For the veins of the one class are small and so the moisture in its downward course cannot readily flow through them, while in the case of persons of dwarf-like structure and large heads, there is a great pressure and evaporation towards the upper parts. Large-veined persons are not 17 given to sleep because of the facility for the passage of blood[1] in the veins, unless there be some adverse conditions present. Neither are the atrabilious especially inclined to sleep. For their internal parts are cool and so no considerable evaporation takes place in them. Consequently owing to their dryness they are fond of eating. For the condition of their bodies is such that they seem to have eaten nothing. For the black bile, 18 being in its nature cool, cools the nutritive region and the other parts, where this excretion of bile is potentially present. From the foregoing, one sees that sleep is an 457 *b* internal concentration of heat and a natural reaction from the cause named. For this reason a person in sleep 19 moves a great deal. From the moment that the heat ceases to rise, however, the person becomes cool and owing to the cooling the eyelids fall shut. And so the upper and outer parts of the body are cool, while the inner and lower ones, *e.g.* the feet and the entrails, are warm. Yet 20 one might be in doubt as to the statement that the deepest sleep occurs after eating, that wine and other

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[1] The circulation of the blood was, of course, unknown to Aristotle. He knew only of its direct passage from the heart to the extremities and of its movement to the brain and return. (456*b* 23 ; *De insom.* 461*b* 7 ff). The brain, being the coldest organ of the body, performed the function, as Aristotle supposed, of reducing and regulating the temperature of the blood.

similar heating drinks are narcotic. To regard sleep as a
cooling process is not reasonable; it is rather caused by
21 heat. Or is one to suppose that analogously to the
stomach which is warm when it is empty but as soon as
it is filled becomes cool through its processes, so the
channels and divisions of the head are cooled by the rise
of evaporated matter? Or are we to suppose that
analogously to persons pouring warm water over themselves
and then suddenly shivering, so after the heat has
risen, the collected cold produces a chill and in this way
22 counteracts the natural heat and drives it back? Again,
when a large quantity of food is taken, which drives the
warmth upward, the stomach is cooled, until digestion
takes place, just as fire is cooled when fresh wood is laid
upon it. For sleep occurs, as we said, when crass
evaporation under the influence of heat, rises through the
23 veins to the head. When this can continue no longer,
because an excessive mass has been carried to the upper
parts, then reaction takes place and the evaporated
matter flows back to the lower parts. Consequently
when the rising heat is withdrawn, men sink down
(man is the only animal that stands erect), and when the
heat returns, it causes lapse of consciousness, and later
24 awakens imagination. The explanation we have just
given for the phenomenon of refrigeration is a possible
one. The region about the brain, however, is the chief
factor here, as we have said. The brain is the coldest
part of the body, and in animals that have no brain
25 the part analogous to it is the coldest part. Just
as water is evaporated by the sun's heat and, when
it rises into the upper air, is cooled by the air's

temperature, and condensed falls to the earth once more
in the form of water, so in the rise of heat to the 458a
brain, the excessive evaporation is converted into viscid
matter (for this reason catarrhal affections appear to
come from the brain), whereas the evaporation that
assists nourishment and is normal, returns to the lower
parts condensed, and decreases the heat. The thinness 26
and slender structure of the veins about the brain contribute
to refrigeration, and to the difficulty of their
taking up the evaporation. This is the cause of refrigeration,
even in cases where the evaporation creates
an excessive degree of heat. Waking takes place when 27
digestion has been completed, and the great amount of
heat which is crowded into a small region out of the
surrounding parts, has gained control ([over the cold]),
and when, further, the crass blood has been separated
from the purified blood. The thinnest and purest blood
is in the head, the thickest and most turbid in the
lower parts. The primary source of all blood is, as 28
we have said in this treatise and elsewhere,[1] the heart.
Between the two chambers of the heart there is a
middle chamber connected with both.[2] The two

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[1] *De part. an.* 648*b* 4; *de juvent.* 468*b* 32; *de respir.* 474*b* 7.

[2] According to Aristotle there are three cavities or chambers in the heart, which he calls right, left, and middle. The right cavity is the largest, the left one the smallest, and the middle one is middle-sized. The right cavity in Aristotle's conception is identical with the right ventricle, which he saw in a suffocated animal and in a disturbed state, so that it appeared larger than the middle cavity (the left ventricle). This in turn appears larger than the collapsed left auricle, which is Aristotle's left cavity. The fourth cavity or right auricle was merged by Aristotle in the great vein, because, as Huxley says (*Nature*, vol. xxi. p. 2), the vena cava inferior, the right auricle, and the vena cava superior and innominate vein, when distended with blood, appear "to

chambers severally receive blood from the two arteries, from the great artery and the aorta, and the separation takes place in the middle chamber. The detailed treatment of this subject, belongs, however, more properly to other treatises. On account of the unseparated character of the blood after taking food sleep occurs and continues until the purest element is separated off and carried to the upper parts, and the more turbid element to the lower parts. When this is accomplished, sleepers are released from the heaviness caused by food and awake. The cause of sleep has, therefore, been explained as the reaction of crass vapour, which rises under the influence of its inherent heat on the primary organ[1] of sensation. Sleep has also been explained as the inhibition of the primary sense-organ, and its incapacity for function, and as a necessary phenomenon (for no animal can exist apart from the conditions which develop its nature), and sleep[2] exists for the sake of preservation, for rest preserves.

29 (beside "ration takes place in the middle chamber"); 30 (beside "by food and awake")

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form one continuous column, to which the heart is attached as a sort of appendage." Consequently, instead of a right and left auricle and a right and left ventricle, Aristotle distinguished only three cavities, a right, a left, and a middle. Cf. *De histor. anim.* 496*a* 4 ff.

[1] The heart.

[2] For the history of the various ancient theories of sleep see Spitta, *Die Schlaf- und Traumzustände der menschlichen Seele*, Tübingen, 1882, pp. 2 ff., and Radestock, *Schlaf und Traum*, Leipzig, 1879, pp. 240 ff.

ON DREAMS.[1]

CHAPTER I.

WE must next investigate dreams and inquire first of
all in what part of the soul this phenomenon occurs, 458 *b*
and whether it is an affection of the thinking power
or of the sensible power. For it is solely by these two
powers within us that we know at all.[2] If the use of 2

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[1] Dreams are due to revived movements originally set up by external stimuli as well as to immediate sense-impressions. The former are centrally excited, to use a modern distinction, while the latter are peripherally excited (cf. 460*b* 25 ff., 462*a* 8 ff., 463*a* 7 ff., 779*a* 14). In our waking state these movements are for the most part obliterated or obscured by stronger currents of thinking or feeling. In sleep, when the blood is less disturbed, these dream-movements come to clear consciousness. So it is that a bodily discomfort that is not felt in waking stirs a dream in sleep. It also happens that a dream may lead to action by day. Dreams, which are images or after-motions of sensations, are regular or distorted in proportion to the amount of physical disturbance at hand and the number of cross-sensations (461*a* 16). Aristotle defines a dream as "a movement in the organs of sense produced by imagination" (462*a* 8, cf. 462*a* 28). Dreams rise to the surface of consciousness when they are released from the stronger movements that restrain them, just as artificial frogs rise to the surface when the salt is melted off (461*b* 16).

[2] Cf. *De an.* 429*a* 31, 431*b* 20 ff.

sight is vision, and of hearing audition, and of sense in general sensation, and, on the other hand, if there are common sensibles[1] such as form, magnitude, number, etc., and particular sensibles, such as colour, sound, flavour, and, further, if it is impossible for any animal to see with its eyes closed and asleep, and if this applies equally to the other senses, then it is evident that we have no 3 sensation in sleep, and so it is not by means of sensation that we experience dreaming. Neither are dreams mediated by opinion. For we not only say that an approaching object is a man or a horse, but also that it is white or beautiful, as to which qualities opinion[2] apart from sensation makes no deliverances, whether true 4 or false. However, this is just what the soul does in sleep. For, as in waking, so in sleep, we believe we see that the approaching object is a man, and that it is white. Again, we think of other things along with the dream, just as is the case with perception in our waking state. For we also often think about what we perceive. So in sleep along with our imaginings we sometimes have 5 different thoughts. This would become apparent to anyone who would give attention on rising and try to remember. There have been persons who have in this way observed their dreams, as *e.g.* those who try to arrange their deliverances in accordance with the precepts of the mnemonic art.[3] For it often happens in their case that along with the dream they put something else, an image before their eyes, in the place in question. And so it is 6 clear that not every image seen in sleep is a dream, and what we think conceptually we regard as true or false through the organ of opinion. So much is clear on this subject that the same agency which in disease produces illusion while we are awake, also produces the condition of illusion in sleep. Even when we are in sound health and know the truth, still the sun appears to us to be only a foot in diameter. But whether the soul's 7 powers of imagination and sensation are the same or different, in any case dreams do not take place independently of seeing and some sort of sensation. For illusions of sight and hearing occur when a person really sees and hears something, although not the thing that he thinks he sees or hears. In sleep, however, there is according to the foregoing hypothesis no seeing, no hearing, no 459a sensation at all. The hypothesis that there is no vision 8 is, therefore, untrue, and that sensation experiences no excitation is untrue; on the other hand, it is possible for sight and the other senses to undergo some change and things impinge on each of them to a certain extent, as in the sensation belonging to the waking state, though with a certain difference. Sometimes opinion declares that the seen object is false, as in the waking state; sometimes it is held in check and conforms to the imagination. Evidently the affection which we call dreaming does not 9 belong to opinion or to the thinking part of the soul. Neither does it belong to the sense-part unqualifiedly. For it would then be possible to see and hear unqualifiedly. But we must consider in what sense and in what way it attaches to the part. Let us take this evident fact for a 10

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[1] *De an.* 418*a* 15.

[2] *De an.* 427*b* 20 ff., *Post. Anal.* 88*b* 33 ff. Opinion refers to the contingent or to that which may or may not be true (ἐνδεχόμενα δὲ καὶ ἄλλως ἔχειν).

[3] Cf. *Top.* 163*b* ff., *De an.* 427*b* 19.

starting-point, that if sleep is a condition of the sensitive part, so is dreaming. For sleeping and dreaming are not ascribable to different animal organs, but to the same
11 organ. Inasmuch as we discussed imagination in the treatise *On the Soul*,[1] and inasmuch as we find that the power of imagination is one with that of sensation, only that the mode of expression in the two cases is different, imagination being a process stimulated by an actual sensation, and since dreaming appears to be a form of imagination (for we call an imagination which we experience in sleep a dream, whether it is unconditioned or conditioned), it is evident that dreaming is a condition of the sensitive part,[2] but of the sensitive part in its power to imagine.

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[1] *De an.* 427*b* 14, 429*a* 9.

[2] *Vid.* Note 1, p. 231.

CHAPTER II.

We might best observe the nature of dreams, and the way in which they are caused, from the standpoint of what occurs in sleep. For sensible objects stimulate sensation in the several sense-organs, and the mental condition produced thereby is not only present during the active process of sensation, but persists after the sensation has gone. The phenomenon here seems to be similar to that observed in the case of thrown objects. For in the case of a thrown object, the 2
movement persists although the mover is no longer in contact with the thing. For the moving body communicates motion to a certain part of the atmosphere, and this in turn sets another part in motion. And in this way motion is caused both in the air and in water until the body comes to rest. One must 459 *b*
suppose that something like this takes place also in qualitative[1] change. A body that is warmed imparts by means of its heat warmth to the adjacent body, and

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[1] For Aristotle's conception of the various forms of motion, see Note 1, p. 223.

this in turn distributes it further on until it reaches its
3 terminal point. This, therefore, is what must take place in the organ wherewith we experience sensation, since actual sensation is a kind of qualitative change. Consequently, this condition is found in the sense-organs not only during the process of sensation, but also after the process has ceased, and in their inner depths as well as
4 on the surface. This becomes evident when we have a sensation that continues over some time. For when we turn our senses to something else, the original sensation persists, as *e.g.* when we turn from the sun to a dark object. The result is that one sees nothing owing to the fact that the sense-process, stimulated by the light, still lurks in the eyes. And if one looks a long time at a single colour, whether it be white or green, things appear to be similarly coloured wherever we turn our eyes.[1]
5 Again, if we look at the sun or some bright object, and then shut our eyes, there appears to sharp observation, in the direct line which vision employs, first of all a colour like the actual one, which then changes to scarlet, then to
6 purple, until it passes into blackness and vanishes. Also, the senses are affected in this way when they turn quickly from objects in motion, *e.g.* from looking at a

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[1] Aristotle refers to the familiar phenomenon of 'after-images.' The fact that the attention was fixed (in Aristotle's illustration) a considerable time, and that he mentions the 'flight of colours,' shows that the reference is to 'positive after-images' and not to 'primary memory images,' a distinction unknown, of course, to Aristotle. Cf. Sully, *The Human Mind*, vol. i. p. 278; James, *Principles of Psychology*, vol. i. p. 645; Ebbinghaus, *Grundzüge der Psychologie*, p. 244; Helmholtz, *Handbuch der physiologischen Optik* (ed. 1867), pp. 366 ff.; Wundt, *Human and Animal Psychology*, pp. 108 ff.; Titchener, *Experimental Psychology*, vol. i. part ii. pp. 48 f.

river, and especially from looking at swiftly flowing streams. For objects at rest then seem to be in motion. And men are made deaf by loud noises, and their sense of smell is destroyed by strong odours, and so on. This evidently occurs as we describe it. 7

That sense-organs readily detect even minute distinctions is proven by the use of a mirror, concerning which fact one might stop at this point to investigate and make inquiries. From these inquiries it will at the same time become plain that just as sight is subject to an impression, so it exercises an activity. When women look into 8 a very clear mirror[1] after their menstrual flow, the mirror's surface becomes covered with a bloody cloud, and if the mirror is new the stain is hard to remove, but if it is old 9 the removal is easier. The reason is that the eye, as we 460 a said, not only receives an impression from the air, but it also produces an impression and a movement, just as bright things do. For the eye is classed amongst objects that are bright and possess colour. Eyes are constituted in the same way, it is reasonable to suppose, as any other

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[1] Ancient mirrors were made of polished metal. The phenomenon here described is one of many of the old-wives' stories which Aristotle took up in his treatises and to which he appears to have given credence. Aristotle, we must remember, had no considerable body of critically sifted and scientifically accredited data to work with. He was dependent chiefly on his own observations and the reports brought to him by unskilled persons, in an age before people had concerned themselves about the laws of evidence. It is just this historical environment that shows us how great was the ordinarily sober judgment of Aristotle and how unparalleled his acumen in seeing the scientific significance of facts. It is, however, curious to note that Roger Bacon accepts the story as true: "quoniam si ipsa [mulier menstruata] aspiciat speculum novum, apparet nubes sanguinea in speculo ex violentia menstrui inficientis (*Opus Majus*, ed. Bridges, vol. i. p. 142). *Cf.* Lewes, *Aristotle*, p. 172.

bodily organ. And so they naturally contain veins.
10 When, therefore, the menstrual flow takes place, owing to disturbance and flow of blood, there is a difference in the eyes, imperceptible to us, but nevertheless real (for the seed and the monthly flow have the same nature), and the air is set in motion by the eyes, and the air being continuous to the mirror, it imparts to the latter a certain quality and an impression similar to the one it has itself received. The air affects the surface of the mirror.
11 But as the cleanest clothing is the most readily stained, so it is here. For a clean thing shows exactly whatever taint it receives, even the slightest effects, more than other things do. Bronze especially, owing to its smoothness, is affected by every contact (we must regard the contact of air as a kind of friction, as cleaning or washing), and owing to the purity of the bronze this contact, however
12 slight, becomes visible. The reason why stains are not readily removable from new mirrors is to be found in the fact that they are clean and smooth. For stains penetrate deep into such mirrors and in every direction; for owing to the mirror's pure surface the spots go deep and owing to its smooth polish they spread in all directions. In old mirrors the stain does not fasten, for it does not
13 penetrate so deep but stays rather on the surface. From these facts it is evident that movement is excited by slight distinctions, that sensation is swift, and further, that the sense-organ for colour not only receives impressions but also reacts on external objects. Facts regarding wine and the preparation of ointments also
14 furnish proof for these statements. For the prepared oil and wine readily take up the smells of adjacent

objects and they become tainted not merely with the smell of things thrown into them or mixed with them, but also of things that are placed or grow in their near neighbourhood.

In reference to our original inquiry let us lay down 460*b*
one fundamental truth, which is evidenced by what has 15
been said, viz. that after the removal of the external sensible object, the experienced sensations persist. To this we must add that when under the influence of strong feeling we are easily deceived regarding our sensations, different persons in different ways, as *e.g.* the coward under the influence of fear and the lover under that of love have such illusions[2] that the former owing to a trifling resemblance thinks he sees an enemy and the latter his beloved. And the more impressionable the
person is, the less is the resemblance required. Similarly 16
everybody is easily deceived when in anger or influenced by any strong desire, and the more subject one is to these feelings the more one is deceived. This is the reason why men sick of a fever[1] sometimes think they see animals on the walls owing to some slight resemblance in the figures
drawn there. And this tendency to illusion at times 17
keeps pace with the intensity of the emotional experience, so that in cases where the patient is not very sick, he is still conscious of the deception, but where his condition is more aggravated, he even rushes upon these animals. The explanation of this phenomenon is that the intellect

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[1] Aristotle here notes certain of the main causes of ordinary illusions and hallucinations, although the hallucination of fever-delirium is here described rather as illusion. The sense-stimulus is there in the picture on the wall, but the inference is false. Cf. James, *Principles of Psychology*, vol. ii. p. 86.

18 and the faculty in which our images[1] arise do not pass judgment with the same power. A proof of this is that the sun appears to us only a foot in diameter and there is many another fact which contradicts our imagination. Also by crossing the fingers[2] a single object under them appears to be two and yet we do not say there are two; 19 for sight is more decisive than touch. If, however, touch were our only sense, our judgment would declare that the single object is two. The source of illusion is found in the fact that things, whatever they may be, are perceived not merely while the stimulation of the sense-object continues, but also during the further activity of the sense itself, if this movement is the prolongation of that awakened by the sensible object. I mean, *e.g.* the shore appears to sailors to move, although it is by something other than the shore that the eye is set in motion.

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[1] Read *ᾧ τὰ φαντάσματα γίγνεται* instead of *τὰ φαντάσματα γίγνεσθαι* (460*b* 17). The imagination, in Aristotle's psychology, does not pass judgment, although the 'common sense,' in which phantasms reside, has this power.

[2] This is the oldest example of illusion, so far as I know, in the history of psychology (cf. James, *Principles of Psychology*, vol. ii. p. 86). The illustration has become classical. In the normal position of our fingers (from which part of our tactual world has been built up), it is impossible to place the radial side of the index finger and the ulnar side of the middle finger on a marble or similar small object at the same time. Consequently when we cross our fingers and perform this feat of touching the radial side of the one and the ulnar side of the other with a marble, we seem to touch two objects, because these two points on our skin are never touched by a single object at the same moment. Aristotle further refers to this instance of illusion in *Probl.* 958*b* 14. and *Metaph.* 1011*a* 33. For a detailed discussion of this and similar forms of illusion, *vid.* Henri, *Über die Raumwahrnehmungen des Tastsinnes*, pp. 67 ff.

CHAPTER III.

From these considerations it is clear that sense-processes,
whether arising from external objects or bodily activities,
take place not merely during the waking state, but
occur also in sleep, and that at this time they appear
even more numerous. For during the day they are 2
kept in the background by the combined activity of
the senses and the intellect, and so are obscured, just 461 *a*
as a small fire is obscured when placed alongside a larger
one, or as trivial pleasures or pains are obscured alongside
of great ones, but when the latter have vanished then
the smaller ones rise to view. At night, owing to the
inactivity of the special senses and their incapacity to
function, caused by the return flow of heat from the
outer into the inward parts,[1] these sense-movements
are carried to the primary seat of sensation and
become clear, when the disturbance has subsided. And
we must suppose, as tiny whirlpools occur in rivers, so 3
each movement goes on continuously, frequently in the
same direction, and again resolved into other forms
through counter-influences. Consequently after eating, 4

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[1] Cf. *De somno*, 457*b* 20 ff.

and in the case of very young persons, as *e.g.* in children,
dreams do not occur. For there is a strong movement
5 excited by the heat in food. The case here is similar to
what occurs in water when it is violently agitated, viz.
sometimes no image is reflected and sometimes only an
entirely distorted one,[1] so that the thing appears different
from the reality. On the other hand when the water is
still we see clear and distinct images. So, too, in sleep
the images and residual movements resulting from
sensations are sometimes entirely obliterated by a movement
greater than the given one, and sometimes visions
appear confused and monstrous and the dreams are not
marked by normal health, but are such as one finds in
the atrabilious, in men sick of a fever, and in men that
are drunken. For all these conditions are like flatulency,
6 and excite great movement and disturbance. But when
in sanguineous creatures the blood has come to rest and
is separated off,[2] the movement of sensation that proceeds
from each sense-organ and persists, awakens normal
dreams and causes an image to appear and the person to

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[1] Cf. note 1, p. 231. Sensations cause after-movements like the ripples and circles in water agitated by a pebble. These movements repeat themselves in fainter form, clearly in still water, and with distorted, broken shapes where the water is disturbed by cross-movements. The circles or images are then confused or monstrous. If the movement is too violent, as after eating and in children, then, as in violently agitated water, no image or dream is produced.

[2] That is, purified from crass elements. Although Aristotle makes a distinction between pure and crass blood, it is not certain that these are to be connected with the aorta and vena cava, or that they in any way correspond to arterial and venous blood. This separation takes place in the heart, which is at once the physiological and the psychical centre of animal life,—the "acropolis of the body" (*De part. anim.* 670*a* 26).

believe that he sees something owing to the influences
discharged from sight, and to hear owing to the influences
discharged from hearing, and similarly with the other 7
senses. For by the transmission of this movement from
these special organs to the primary seat[1] of sensation,
one believes, in the waking state, that one sees and hears 461 *b*
and perceives; and because it sometimes happens that
sight seems to be stimulated without its being really so
stimulated, we say that we see, and because touch reports
two movements, we believe a single object to be two. In 8
a word the primary sense affirms the deliverances of the
special sense, when no other more decisive sense contradicts
this. There is without doubt an appearance,
but what appears is not in every case believed, unless
the power of judgment is inhibited or is not exercised
in its normal way. But as we said that some 9
persons are subject to illusion under one condition and
others under another, so when asleep, one is deceived
by the processes of sleep, by the excitations of the
sense-organs, and by other affections of sensation,
to such a degree that something which bears only a 10
slight resemblance to a given thing is thought to be
that thing. For when one is asleep and the mass
of blood recedes to the central organ, the movements
in the blood, whether latent or actual, concentrate
there.[2] And the conditions here are such that if the
blood is stirred, a particular movement rises to the
surface and if this subsides, then another follows. They
are related to each other like artificial frogs which rise to
the surface of the water as soon as the salt on them is 11

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[1] To the heart.

[2] *De somno*, 456*b* 23. Cf. note, p. 227.

melted off. And so these movements are latent in the
blood, and as soon as the hindrance is removed they
come to active expression. When set free in the small
amount of blood remaining in the sense-organs, they stir
themselves, exhibiting a likeness to things such as we see
in clouds, which resemble men and centaurs in quickly
12 shifting forms. Each of these images is, as we have said,
the residue of actual sensation. After the true sensation
has gone, the image continues, and it is correct to say that
it is something like Coriscus although not Coriscus. And
at the moment of sensation the master-organ and judging
faculty do not say that this is Coriscus, but only that
owing to this sensation the real Coriscus is yonder
13 person. On experiencing this sensation the master-sense
makes the above deliverance, provided it is not entirely
inhibited by the blood, just as without sensation this
movement is set up by the processes latent in the sense-organs.
This latter, which resembles a thing, one then
regards as the real thing. And the power of sleep is so
14 great that it causes us to be unconscious of this difference.
If one presses one's fingers under the eyes and does not
462 a notice it, a single thing not only appears double but is
believed to be so; if the pressure is noticed the thing
appears to be double but is not believed to be so, and
this is what happens in sleep. If a person perceives
that he is asleep and is aware of the sleeping condition
in which the sensation occurs, then the appearance will
be present indeed, but there is something in the person
which says this is only a phantasm of Coriscus and is
not Coriscus himself (for there is often something in the
soul of the sleeper which says that the appearance is

only a dream). If, however, he is not conscious of the sleeping state, then nothing contradicts the imagination.

That the above statement is correct, and that we have 15 movements of imagination in the sense-organs, becomes clear, if in falling asleep and on waking, we attentively try to remember what happens.[1] For sometimes one will detect, on waking, that the images which appear in sleep are movements in the sense-organs. In the case of certain young persons whose sight is thoroughly good, there appear before them, when it is dark, a multitude of moving images, so that they conceal themselves in fright. From all these facts one must conclude that a dream is 16 a kind of sleeping phantasm. For the imaginings in children just referred to are not dreams, nor is anything else which is seen when we have the free use of our senses. Neither is every imagination that occurs in sleep, a dream. For in the first place many persons 17 have in sleep the power, in some form or other, of perceiving sound, colour, flavour, or touch, although the sensation is weak and seems to come from afar. Persons who are asleep and open their eyes slightly, and then suddenly awake, have discovered the reality of the lamplight, which in sleep they saw only, as they thought, in a glimmer, and hearing the faint crowing of a cock, or the bark of a dog, they have, on waking, recognised them as loud voices. Some persons even reply to questions. 18 For it is possible that when one or the other of these states, waking or sleeping, is unquestionably present, the other may be present to some extent. In these cases

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[1] One may see from this that Aristotle was a careful observer of the phenomena of consciousness.

there can be no dream, neither can such processes of real
thought as occur in sleep, along with fancies, be called
19 dreams.[1] But a dream is that form of imagination that
originates in the movement of sensation during the
sleeping state as such.

It has occurred in certain instances that men have
20 never in their lives known themselves to have a dream:
462 *b* in other cases they have observed them when far
advanced in years without having noticed them earlier.
21 The reason why dreams do not occur in these cases
seems to be closely allied to the reason which prevents
their occurrence in children, and after eating.[2] For
persons who are by nature so constituted that a large
amount of vaporous-matter ascends to their upper parts, or
the return of this matter produces in them great movement, it is reasonable to suppose that in these cases there
22 are no dream-fancies. In advancing years there is nothing
remarkable in the fact that dreams make their appearance. For where a certain ([physical]) change takes place,
whether owing to age or to some internal affection, this
changed condition ([regarding dreams]) must also occur.

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[1] The cases in which one distinguishes an actual external stimulus are not properly dreams.

[2] The question whether or not there is dreamless sleep is not a settled one (cf. James, *Principles of Psychology*, vol. i. p. 199 ff.) Hammond, *Sleep and its Derangement*, pp. 108 ff. The Cartesians, consistently with their definition of mind as a thinking entity, deny the possibility of a lapse of consciousness. Owing to its nature mind must always think. Kant says: "One can regard it as certain that there can be no sleep without dreaming, and whoever says he has never dreamed, has only forgotten his dream." *Anthropologie*, 4te Aufl., Leip., 1833, p. 105. The disposition of modern psychologists is to regard dreamless sleep as probable, but the question is not likely to be removed from the region of dispute. Cf. Wundt, *Human and Animal Psychology*, Eng. Tr., p. 324.

ON PROPHECY IN SLEEP.

CHAPTER I.

REGARDING prophecy in sleep and the prophecy said to
be derivable from dreams,[1] it is difficult either to treat
it with contempt or to believe in it. For the universal 2

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[1] The attitude of Aristotle towards the widespread belief in the mantic character of dreams is marked by judicial fairness. He finally concludes, however, that where dreams have been found to be prophetic, this is due merely to accident. Belief in them prevailed and to a certain extent continues to prevail amongst all nations, and is attested by all literatures from the earliest times (cf. Tylor, *Early History of Mankind*, 3rd ed. p. 6 ff.; *Primitive Culture*, 3rd ed. vol. i. p. 121 ff.). "All argument is against it; but all belief is for it," as Tylor (vol. ii. p. 24) quotes from Dr. Johnson. This very accurately represents the state of Aristotle's mind toward the prophetic character of dreams. Greek literature especially is full of references to mantic dreams, and the general soothsaying usages in Greek religion fostered belief in them. Oneiros (Dream) is sometimes called a god (*Il.* ii. 6), again the messenger of Zeus, and Hesiod (*Th.* 212) tells us that dreams are the children of Night without a father, and the divine origin of dreams is witnessed to by Socrates (*Crito*, 44 A) and Xenophon (*Anab.* iii. 112). Aristotle belonged to the same intellectual era as Socrates and Xenophon. We find a similar belief in the prophetic nature of dreams witnessed to by the Hebrew Scriptures and the New Testament (*Gen.* xxviii. 12, xl. 5-21; *Numbers* xii. 6; *Matthew* i. 20).

or widespread belief in the prophetic nature of dreams,
based as it is on experience, lends support to this view,
and it is not incredible that certain events are foreseen
in dreams. There is a certain reasonableness in this,
and so one might, in like manner, apply this belief to
3 other dreams. The fact, however, that one cannot dis-
cover any intelligible cause for their occurrence, creates
distrust in them. The theory of divine origin is absurd,
because in addition to its irrationality, one observes
that these dreams do not come to the best and wisest,
4 but to all sorts of men. But when their divine causa-
tion is excluded, there is no other reasonable origin that
one can assign. For it seems to transcend our power
of understanding to discover an explanation of the story
that certain persons foretell the future through legends
on the pillars of Hercules or on the Borysthenes. Dreams,
5 taken either in their entirety, or partially, or singly,
must then be causes or signs of events, or else they
6 must be accidental phenomena. 'Cause' I understand
in the sense of the moon's being the cause of the sun's
eclipse,[1] and fatigue being the cause of fever; by 'sign'
I mean *e.g.* that a sign of an eclipse is a star's becoming
visible in daylight or the roughness of the tongue in
fever; by an 'accidental phenomenon' I mean *e.g.* that
an eclipse of the sun happens while one is taking a
463*a* walk. For taking a walk is neither sign nor cause
of an eclipse, neither is an eclipse the sign or cause
7 of taking a walk. Consequently no accidental pheno-

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[1] Cf. *Anal. post.* 98*b* 1, 99*a* 1 ff. Cause contains inherently the explanation of a result; sign is merely a concomitant or a precursor, and has only an accidental relation to the result.

menon takes place constantly or even as a rule. Is it, then, possible that some dreams are causes and others signs, *e.g.* of physical events? Well-educated physicians, at any rate, say that we should pay close attention to dreams. And this view is also regarded as reasonable by laymen who are investigators and philosophers. For the psychical movements that occur by day, unless they 8 are very full and vigorous, are unnoticed when they are experienced along with greater waking excitations. In sleep, however, the reverse is true. For then the trivial movements seem to be the important ones, as 9 is apparent from frequently observed facts regarding sleep. When slight noises fall upon the ear one thinks it lightens and thunders, and when a bit of mucus flows into the mouth one thinks one is tasting the sweet flavour of honey, and when a very slight heat is felt in any member one thinks one is walking through fire and is fever-hot. But when one awakes one dis- 10 covers the real facts. Since, then, all beginnings are small, it is evident that the beginning of disease and other bodily affections on the point of development will be small, and these necessarily show themselves more in sleep than in the waking state. Yet it is really 11 not unreasonable to suppose that certain sleeping fancies are causes of actions peculiar to the individual. For when we are on the point of doing something or are in the midst of it or have accomplished it, it frequently happens that we are occupied and busy with the same thing in a distinct dream (the explanation of which is that the dream movement has been already started from origins in the day's activity); and as this is true, so the converse must be true, viz. that the movements in sleep are often the starting points for the activities of the day, because the thought for the latter is already 12 started on its way in our nocturnal fancies. In this sense, therefore, certain dreams may be signs and causes. But most prophetic dreams are things of chance, especi-463 b ally all those that transcend us and whose origination is not in our power, as *e.g.* a naval battle and remote events. The situation here is just like that of a man who thinks of a thing and in that instant the thing appears. For what is there to prevent this being also true of dreams? It is even more likely that many 13 accidents of this sort should occur here. Just as, in the former case, thinking of a thing is neither sign nor cause of the thing's appearing, so here the beholder's dream is neither sign nor cause of the event, but only accident. Consequently most dreams do not come true. For chance is that which occurs neither constantly nor even as a rule.

CHAPTER II.

SINCE other animals[1] than man have dreams, one may
say, in a word, that dreams are not sent from God and
do not occur for his ends. They are, however, daemonic.
For their nature is daemonic, but not divine. This is 2
proven by the fact that very ordinary men have prophetic
visions and true dreams, showing that God does
not send them; but such men as have a loquacious and
atrabilious nature see all sorts of visions. And because
these excitations are many and diversified they chance
upon thoughts which correspond with reality, hitting
the right thing here just as one sometimes hits in the
game of "Odd and Even."[2] For in this instance the
proverb applies: "Who often shoots will sometimes hit."

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[1] "Quippe videbis equos fortis, cum membra iacebunt,
In somnis sudare tamen spirareque semper
Et quasi de palma summas contendere viris,
Aut quasi carceribus patefactis
Venantumque canes in molli saepe quiete
Iactant crura tamen subito vocisque repente
Mittunt et crebro redducunt naribus auras."
—Lucretius, *De rer. nat.* iv. 987 ff.

[2] Read Bekker's conjecture *ἀρτιάζοντες* instead of *ἄρτια μερίζοντες.*

3 That many dreams do not come true is not strange. For even the signs in physical and heavenly processes, such as the signs of rain and wind, often fail. For if another movement sets in which is stronger than the one indicated, the indicated event does not take place. Also many well-
4 matured plans of what ought to be done fail of execution, because other more important motives arise. For not every expected event occurs, and one must not identify the future with the expected.[1] Nevertheless one must say that there are certain causes to which this lack of fulfilment is due, and these are natural signs of the
5 non-occurrence of the given events.

In regard to dreams which are not due to such origins
464 *a* as we have mentioned, but to origins that either in point of time, place, or magnitude are extraordinary, or which are not to be described in this way at all, and yet the dreamer does not have in himself the cause—in these cases, unless the prophetic character is accidental, it would be better to explain such foresight in the following way, rather than in the way employed by Democritus.[2]

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[1] Ἐσόμενον signifies the future absolutely and μέλλον the future contingently. Cf. *De gen. et corr.* 337*b* 6.

[2] Democritus explains dreams by the same principles—images and effluxes—that he employs in the explanation of sensation. The images (εἴδωλα, simulacra) thrown off by things are complexes of atoms, which represent not merely the form, but also the inner qualities of things. They are the things in miniature, and are capable of conveying psychical processes, as well as physical features, from one person to another. Mind has an atomic composition, and it is owing to this fact that the opinions and feelings of friends are conveyed to us by their dream-images. Prior to Aristotle almost all philosophers, like Democritus, sought for an explanation of dreams outside the dreamer, dominated, as they were, in greater or less degree by contemporary superstition. Cf. Cicero, *De divinat.* i. 43; Plutarch, *De plac. phil.* v. 2, *Quaest. conv.* viii. 10.

who explains them by images and effluxes. Just as when 6
water or air is stirred, the stirred part sets another part
in motion, and after this has come to rest a similar
motion is continued up to a certain point, even in the
absence of the moving agent, so nothing prevents a
certain movement and sensation from reaching the soul in
sleep, produced by those objects from which Democritus
says images and effluxes are thrown off. And these
movements, reaching the soul in some way or other, are
more distinctly felt at night, because they are more
readily dissipated when they enter by day (for the night
air is less apt to be disturbed owing to the calmer nature
of night), and they awaken sensation in the body on
account of sleep, for persons when asleep detect slight
internal processes more sharply than when awake. These 7
movements awaken fancies, out of which one foresees the
future in events similar to the fancies. This power of
prevision, then, occurs in any ordinary person, and not in
the wisest. For if prevision were sent of God, it would 8
come by day and to the wise. In this manner, however,
it is reasonable that prevision comes to ordinary men.
For the minds of such persons are not given to careful
thought, but are, as it were, reft and empty of all content,
and when stimulated they follow the lead of the moving
agent. The reason why certain persons afflicted with 9
ecstatic mania have prevision is that their own excitations
do not distract them, but are rather thrown off by them,
and, therefore, they have especial perception of processes
foreign to them. That some persons have true dreams, 10
and that familiar acquaintances have prevision especially
regarding each other, comes from the fact that acquaint-

ances concern themselves most about each other. For just
as it is most true of intimate friends that they recognize
and see each other at a distance better than others do, so
it is also with these movements. For the movements of
11 acquaintances are more easily recognized. The atrabilious,
like long-distance throwers, owing to the vehemence of
their natures, hit their aim. And owing to their mobile
464 b disposition they have a quick fancy for sequence. For as
Philaegides[1] in his poems and insane persons recite and
think out sequences that depend on similarity, as illus-
12 trated in the song of Aphrodite, so these dreamers string
together a series of events. For owing to their passionate
nature they are not swerved aside by extraneous move-
ments.

The most skilful interpreter of dreams is he who
can discern resemblances. For a plain dream can be
interpreted by anybody. By resemblances I mean,
as I said before, that the pictures of imagination
13 are very like pictures in the water. In the latter,
when the movement is violent, the reflection and
picture bear no resemblance to the reality. And so a
clever interpreter is one who can quickly distinguish
and see at a glance in the confused and distorted
picture the suggestion of a man, or horse, or whatever
14 the given object may be. And as the picture in the
water, so the dream can be similarly distorted, for

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[1] Philaegides is an unknown poet. Leonicus (quoted by Barthélemy-St.-Hilaire, *Comment. ad loc.*) conjectures Philaenis, a Greek poetess of Leucas, contemporary of the sophist Polycrates, to whom an obscene poem on Love was ascribed. Michael of Ephesus (*Comment. ad loc.* fol. 1527, p. 48) repeats the name Philaegides, as given in the text.

movement destroys the distinctness of dreams. We have now explained the nature of sleep and dreams, and have given the cause of their occurrence, and have further explained the entire subject of divination by means of them.

ON LONGEVITY AND SHORTNESS OF LIFE.

CHAPTER I.

We[1] must now inquire into the causes why some animals live long and others only a short time, and into the general subject of longevity and shortness of
2 life. The initial point in our inquiry must be the stating of certain preliminary problems touching these phenomena. For it is not clear whether or not the cause of longevity and shortness of life is the same in animals and plants. Some plants are annuals, and
3 others attain great age. Further, one may ask whether amongst the creatures of nature the long-lived and the naturally healthy are identical. Or is shortness of life to be kept distinct from questions of disease? Or is it true that some diseases cause the body whose nature is affected, to be short lived, while other diseases in no wise prevent long life?

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[1] I have removed the brackets from the passage 464*b* 19-30, being unable to see any good reason for following Biehl in regarding it as an interpolation.

Regarding sleeping and waking we have already 4
spoken, and we must later on treat the subjects of
life and death, and likewise disease and health, so far
as they fall within the province of the philosophy of
nature. At present we have to consider, as already 465*a*
said,[1] the causes of longevity and shortness of life. This
distinction of longevity marks entire genera in comparison
with others, and again it marks certain members of one
species in comparison with other members. By this I 5
mean there is a generic difference in longevity applicable
e.g. to man and horse (for the genus man is longer lived
than the genus horse), and again within the species one
man is longer lived than another. For some men are
long lived and others short lived, according to the
districts they inhabit. Nations that inhabit warm
countries live longer; the inhabitants of cold countries[2] 6
are less long lived. And amongst those that inhabit the
the same locality there are also between individuals
differences in this respect.

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[1] Retain the reading *καθάπερ, κ.τ.λ.* (465*a* 2) bracketed by Biehl.

[2] This statement is not borne out by statistics, at least under present conditions. Nevertheless the statement may have been correct in Aristotle's time. Inasmuch as the North Countries were then inhabited by people of inferior civilization, it is likely that the period of life was less than it is now under conditions of higher civilization. The more civilized races protect the aged, and so contribute to longevity, besides being generally better equipped with means and methods for self-preservation. Cf. Lankester, *Comparative Longevity*, p. 107 ff.; Van Oven, *Decline of Life in Health and Disease*, pp. 60, 61.

CHAPTER II.

We must understand what is easily destroyed in natural structures and what is destroyed with difficulty. Fire and water and other elements akin to them, without having their power, are, in their reciprocal action, the causes of generation and decay. Consequently, everything else, one may reasonably suppose, that is derived from or composed of these elements, shares in their nature, excepting such things as are artificially composed of a great 2 many parts, like a house. The discussion of these other elements does not belong here. Many things are subject to destruction from causes peculiar to themselves, as *e.g.* knowledge, health, and disease. For these are destroyed when the things of which they are qualities are not destroyed but survive, *e.g.* the agency which destroys ignorance is recollection and learning; the agency which destroys knowledge is forgetfulness and error. Acci- 3 dentally, the destruction of other properties goes hand in hand with the destruction of the natural body. For when animals are destroyed the knowledge and health 4 that are in them are also destroyed. From this one might draw a conclusion regarding the soul. For if the soul is not in the body by natural growth, but is there just as knowledge is in the soul, then it would be exposed to another destroying agency in addition to that to which it is liable in the destruction of the body. But this does not appear to be the case; the relation between soul and body must be differently understood.

CHAPTER III.

465*b* PERHAPS one might reasonably ask the question: Is there any place where the perishable is imperishable, as in the case of fire in the Empyrean, which is subject to no opposing influence; for the properties that attach to opposites are incidentally destroyed by the destruction of the thing itself. For opposites destroy one another. No opposite, however, which belongs to substance is incidentally destroyed, for substance is not
2 predicated of any subject. Consequently, in whatsoever thing there is no principle of opposition, and where there is no such principle, there can be no destruction. For what is there to work destruction, if destruction is effected exclusively by opposites? But there is no opposition present, either absolutely or in any particular part. Or is this true in one sense and in another false? For whatever has matter cannot avoid being in some
3 sense subject to opposition. It can be everywhere hot or straight, but it cannot be in its entirety hot or straight or white. For these qualities would then be separate entities. Whenever the active and passive come together, if the one always acts and the other
4 is always acted upon, change must take place. Further,

if change necessarily produces a residue, then residue involves opposition. For change is always the result of opposition, and residue is that which remains from a state prior to change. But if the actually opposed were entirely excluded, a thing would, in this case, be imperishable.[1] Or is this untrue, but a thing in this event would be destroyed by its environment? If this happens, 5 then the above explanation is adequate.[2] If the destruction is not so produced, one must suppose there is an actual inherent opposition in the thing, and that a residue is produced. For this reason the lesser flame is incidentally consumed by the larger one, because the food which the smaller one consumes in a long time in the form of smoke, is consumed by the larger one quickly. And so everything is in constant motion, constantly coming into existence and passing out of existence. And the environment either assists or opposes. 6 Constantly changing things may last a longer or a shorter time than their own nature prescribes, but nothing lasts for ever, where opposites exist. For at the very start, matter contains in itself the principles of opposition, so that if one employs the category of place, spatial change is involved; if one employs the category of quantity, we have changes of growth and decay; if one employs passivity, then qualitative change.[3]

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[1] That is, if the principle of opposition were excluded there would be no change, and if there were no change, a thing would be indestructible.

[2] The environment, in that case, would supply the principle of opposition, and so the dogma of "no opposition, no destruction" would remain unchallenged.

[3] In other words, the whole of the terrestrial world is subject to corruptibility and change (*Metaph.* 1035*a* 25, 1069*b* 24; *De coelo* 283*a* 30).

CHAPTER IV.

466a NEITHER are the largest creatures less exposed to destruction than others (for the horse is shorter lived than man), nor the small animals (for many insects live only a year), nor, in general, are plants longer lived than animals (for some plants are annuals), nor are sanguineous animals, by virtue of their being sanguineous, long lived (for bees live longer than do certain sanguineous animals), neither are the bloodless animals, as such, long lived (for molluscs, which are bloodless, live only a year), nor land animals (for there are both plants and land animals that live only a year), nor sea animals (for
2 the crustaceans and molluscs are short lived). On the whole, the longest lived organisms are found amongst plants, an example of which is the palm.[1] Next the sanguineous live longer than the bloodless animals, and the land animals longer than those that live in water.[2]

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[1] Apart from the age attained by man, and by certain insects and plants, little is accurately known about the longevity of organisms (Lankester, *op. cit.* p. 12).

[2] Dr. Gunther (quoted by Lankester, *op. cit.* p. 13) says: "There is scarcely anything positive known of the age and causes of death of various fishes," but cases are reported of carp attaining the age of 150

So that the longest lived animals are those where we
find the combined marks of having blood and living on
the land, as instanced in man and the elephant.[1] It is a 3
rule also that the larger animals are longer lived than
the smaller ones. And this characteristic of size applies
to other examples of longest lived animals, as well as
to the instances cited.

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years, and pike 267 years (!) and elephants are reported to have lived as long as 500 years (*ib.* p. 59), but the statements are not properly authenticated. Trees are reported to have attained ages ranging from 335 years (Elm) to 3200 years (Yew), and even to above 4000 years (Taxodium). In the *Popular Science Monthly* (vol. ii. p. 250) the story is told of a carp killed at Chantilly aged 475 years. Weismann says that large trees have the longest life of all organisms in the world, and the "largest animals also attain the greatest age . . . and it would not be difficult to construct a descending series of animals, in which the duration of life diminishes in almost exact proportion to the decrease in the size of the body." *Essays upon Heredity*, Eng. Tr., p. 6. A general rule such as this would, of course, have many exceptions, as *e.g.* in the case of the eagle and horse, the former being inferior in size but superior in longevity.

[1] Aristotle reports the age of an elephant at 200 years, or, according to another report, at 120 years, for his statement is made only on hearsay (*οἱ μὲν φασι*, *Hist. anim.* 630*b* 23).

CHAPTER V.

THE cause of all this might be discovered in the following facts. One must understand that an animal is by nature moist and warm, and life is also moist and warm, whereas old age is dry and cold, and so is death. And this is plain to observation. The matter in living bodies has these qualities of warm and cold, dry and
2 moist. As beings grow old they must then dry up, and so the moist should be constituted in such way as not to dry up easily. Now, fatty elements do not readily decay. The reason is that they contain air, and air compared with other elements is fire. But fire is not subject to decay. The amount of moisture should not be small, for a small amount is quickly dried out.
3 Consequently, larger animals and plants are, as a rule, longer lived than others, as we said before. For it is reasonable to suppose that the larger creatures possess a greater supply of moisture. But it is not merely for this reason that they are longer lived, for there are two causes of long life, a quantitative and qualitative cause. Consequently, there must not merely be a certain quantity of moisture present, but this must also be warm, in order

that it be not easily congealed or dried up. It is for 4 this reason that man is longer lived than certain larger animals. For animals that are defective in the mass of moisture are longer lived, provided their excess in the 466 b quality of this moisture is relatively greater than their defect in its quantity. Some animals have an oily warmth, in consequence of which their moisture is not easily dried up or chilled. Others again have a moisture of a different sort. Further, whatever is meant to be difficult 5 to destroy should not throw off much residue. For this, whether it be due to disease or to nature, destroys a thing. Residue has the significance of opposition and is destructive of a thing either in its entire nature or in some part of it. Consequently, salacious animals and such as abound in seed age quickly. For seed is a residue and when it is thrown off produces dryness. For 6 this reason a mule lives longer than a horse or an ass, and women live longer than men, in cases where men are lascivious. And so male sparrows are shorter lived than females. Further, males subjected to hard labour are short lived, and on account of toil age more rapidly.[1] For toil produces dryness, and old age is dry. In the 7 ordinary course of nature, and taking it all in all, men live longer than women.[2] The reason for this is that the male is a warmer animal than the female. The same

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[1] Excessive expenditure in organic metabolism due to labour, violent activity, inordinate eating, etc., on the one hand, and waste in propagation on the other, reduce the tenure of life.

[2] Statistics show that females have a longer average of life than males (Lankester, *op. cit.* p. 117). A writer in the *Saturday Review* (vol. 79, p. 248) shows that in polygamous races, the males are shorter lived than the females.

classes of animals live longer in a warm than in a cold
climate, for the same reason that the larger animals
8 live longer than smaller ones. Particularly striking in
this connection is the size of the naturally cold animals.
So snakes, lizards, and rough-scaled reptiles found in
warm localities and the testacea of the Red Sea attain a
great size. For warm moisture is the cause of growth
9 and life. In cold districts animal moisture is more
watery and consequently easily congealed, so that
animals with little or no blood, whether their habitation
is the land or water, do not occur at all in the northern
regions, or if they occur they are smaller and shorter
10 lived. For frost impedes growth. Both plants and
animals perish when they get no nourishment, for then
they consume themselves. Just as a larger consumes
and destroys a smaller flame by using up its
food, so the natural warmth, whose primary function is
digestion, consumes the matter in which it is found.
11 Aquatic animals are shorter lived than land animals, not
because they are moist unqualifiedly, but because they
467*a* are watery. Moisture of this sort is very perishable,
because it is cold and easily congealed. For the same
reason the bloodless animal is very perishable, unless it
is protected by great size, because it contains no oily or
sweet element. I say sweet, for animal fat is sweet.
Consequently bees are longer lived than other animals
that are larger.

CHAPTER VI.

IT is amongst plants that we find the longest lived organisms, and these attain a higher age than animals, in the first place because they are less watery and therefore not easily congealed. Secondly, they contain a viscous oily substance, and therefore, although they are dry and earthy, they nevertheless possess a moisture which is not easily dried out. We must now find an explanation for 2
the great age attained by trees. For a peculiar explanation applies to them which does not apply to animals, excepting insects. This peculiarity is that plants constantly renew themselves and so attain great age. For new shoots are put forth from time to time and others grow old. And the same thing is true of the roots.
But this renewal does not take place in all parts at 3
once; sometimes only the trunk and branches die and others grow up alongside of them. And when this happens other roots spring from the remaining part. And so it continues, one part passing out of existence and another part coming into being. Consequently, they live 4
long. Plants have a resemblance to insects, as already said. For life continues when they are divided, and out

of one insect or plant two or several are produced. Divided insects, however, reach merely to the state of living, but are not able to continue long in life. For they have no organs, and the principle of life in the single part has no power to develop an organ. This principle in the plant, on the contrary, has the power of developing organs, for it contains in every case both root
5 and stem potentially. Consequently, the new and the ageing branch keep growing from this, differing little in their length of life, just as it is with grafts. In the grafting of shoots, one would say that in a certain sense this same process occurs, for the shoot is part of a plant. In the grafting of shoots, however, the continuity of life occurs in a state of separation from the mother plant, while in the other cases the lives are
6 conjoined. The reason is that the inherent potential principle in the plant is all-pervasive.

There is, however, a point of identity between animals and plants. In animals the males are, as a rule, longer lived than the females. For their upper parts are larger than the lower ones (the male is more dwarflike[1] than the female); the warm element is found in the upper
7 parts and cold in the lower ones. Also plants with
467 *b* large roots are longer lived than the others. Annuals are not of this kind, but trees are. For the upper part and head of a plant is the root, but annuals have their main growth towards the lower[2] parts and the fruit.
8 These questions will be examined in detail in the treatise

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[1] That is they have larger heads and shoulders.

[2] Viz. towards the branches, which are analogous to the lower parts of man.

ı *Plants.*[1] For the present we have explained the use of longevity and shortness of life in animals. iere remain for our consideration the subjects of outh and Old Age, Life and Death. And after these ive been investigated, our treatise on animals[2] will ive been finished.

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[1] The two books of Aristotle (*Hist. an.* 539*a* 20, *De gen. an.* 716*a* 1), ρὶ φυτῶν, appear to have been still in existence at the time of rmippus, but to have been finally supplanted by the completer work Theophrastus on the same subject. Cf. Zeller, *Philosophie d. Griech.* ı. II. Abth. ii. 3te. Aufl. p. 98.

[2] Owing to this statement Brandis (*Handbuch d. Geschichte d. Philos.* 1192, 93) thinks that only the first five tractates of the *Parva turalia* were written immediately after the *De anima*, while the ree following (viz. *On Longevity and Shortness of Life*, *On Youth d Old Age*, and *On Respiration*) were written after the completion of e treatises on Zoology. There is no reason why this should not be ıe, although proofs from cross-references in Aristotle's writings are ver very cogent for their chronology, such references being often a ter addition. It frequently happens that the treatise X cites the atise Y, and the treatise Y cites the treatise X, such additions and ferences (particularly when at the beginning or end of a work) being ded often by an editorial hand. The *Topics*, *e.g.* quotes the *alytics* (*Top.* 162*a* 11, 165*b* 8), and is quoted by the *Analytics* (*An. ot.* 24*b* 12, 64*a* 37, 65*b* 16).

ON YOUTH AND OLD AGE, AND ON LIFE AND DEATH.

CHAPTER I.

We must now treat of youth and old age, and of life and death. At the same time it may be necessary to explain the causes and conditions of respiration. For in some animals[1] life and death are conditioned by respiration.
2 We have elsewhere treated more precisely of the soul, and it is clear that its ultimate nature cannot be corporeal, although it has its seat evidently in some part of the body, and in some part, too, that has a higher importance amongst the body's members.[2] For the present we must
3 dismiss the other parts or powers of the soul (whatever may be the proper term to apply[3] to them). In regard to

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[1] Only animals endowed with lungs or analogous organ may be said to respire. The employment of water by fishes serves a similar purpose (refrigeration or regulation of temperature), but is not respiration. In such animals as respire, life and death are conditioned by the performance of this function.

[2] In the heart.

[3] Cf. *De an.* 414*a* 30 ff., 433*b* 1, 415*a* 25, 416*a* 20.

creatures that are termed animals and have life, in cases
where they are endowed with both attributes—I mean
with animality and life—it must be that the principle
whereby they live, and by virtue of which they are called
animal, should be one and the same part.[1] For it is 4
impossible for an animal as animal not to have life.
On the other hand, it is not necessary for a thing to be
an animal because it has life. For plants live, and yet
they have no sensation, and it is in terms of sensation
that we distinguish the animal from the non-animal.
Numerically they are one and the same part, although in
their mode of expression they are manifold and different.[2]
For it is not the same thing to be an animal and to have
life. Since amongst our sense-organs there is one which 5
we call a kind of 'common sense,' where all our actual
sensations must come together, this 'common sense' must
occupy a position midway between what we call the anterior
and posterior parts of the body (by anterior[3] is meant that
which is situated towards the region of sensation, and by
posterior that which is situated in the opposite region).
Furthermore, since in all living organisms the body is
divided into an upper and lower half (for all animals as
well as plants have an upper and lower part), the nutritive
principle should evidently[4] occupy a position midway 468 *a*

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[1] *I.e.* nutrition and sensation are functions of one life-principle.

[2] The fundamental mark of a living thing is the power of nutrition and propagation; the fundamental mark of an animal is sensation. Both of these functions in the animal are performed by the central organ.

[3] By anterior is meant upper, *i.e.* towards the region of the senses, which are mainly about the head.

[4] Aristotle assumes this, of course, owing to his teleological view of nature. Nature operates in the way that is best.

between them. The part which contains the organ for admitting food is called the upper part, and we use the term 'upper' here in reference to the body itself and not in reference to the directions of the surrounding universe;[1] by 'lower' we mean the part whose primary function is
6 to void excrement. In this connection we find a wide difference between plants and animals. In man more than in any of the other animals, owing to his erect attitude, we find the upper part turned towards the upper part of the universe; in the other animals[2] the upper part is turned in a direction midway between the upper and lower parts of the universe; in plants, which are fixed on one spot and draw their nourishment from the earth, this upper part must in every case have a down-
7 ward direction. For roots in plants and mouths in animals are analogous organs, by means of which in the one case food is derived from the earth, and in the case of animals through themselves.[3]

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[1] Upper in reference to the universe signifies the direction in which flame and light substances move (cf. *Phys.* 200*b* 19, *Metaph.* 1065*b* 13).

[2] Cf. Sallust, *De conjur. Cat.* i.

[3] Animal food in its final form is, in Aristotle's theory, the blood. Cf. *De somno*, 456*a* 34; *De juvent.* 469*a* 1, 32; *De part. an.* 678*a* 6.

CHAPTER II.

ALL perfectly developed animals are analysable into three parts—one for the admission of food, a second for the voiding of excrement, and a third midway between these two. The last of these is called in larger animals the chest, and in the smaller some equivalent term is used;[1] in some animals, however, it is more clearly articulated than in others. Again, such animals as are 2 capable of progressive motion have, in addition to the parts mentioned, other organs adapted to the service of movement and to carrying the entire trunk—as legs, feet, and other organs that have the same function as these. The nutritive principle of the soul is situated in 3 a region central to these three parts, as is evident both from observation[2] and reason. In fact there are many animals which, after one or the other part has been cut off, even the head and the organ for seizing food,

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[1] The general thoracic region.

[2] That is, on empirical and *a priori* grounds. If this central situation is the best for the performance of functions in which the entire body is interested, then it is reasonable to suppose, Aristotle says, that nature has placed the nutritive principle here.

continue to live in that part to which the middle is
4 conjoined. This fact may be plainly observed in the
case of insects, such as wasps and bees. Also many
animals besides insects, when cut in two, can continue
to live by the functioning of the nutritive principle.
This nutritive part is actually unitary, but potentially
multiple, and the natural construction of these animals
is the same as that of plants. For plants after they are
divided continue to live in segments, and from a single
5 origin one can by section produce several[1] trees. Why it
is that some plants cannot continue life after section, while
others can be propagated, must be explained elsewhere.
468 *b* In this respect, however, plants and insects as a class are
alike. It is necessary that the nutritive principle in
those living things that possess it[2] should be actually
6 one, though potentially multiple. And the same holds
good of the principle of sensation; for the segments
evidently have sensation. In reference to the maintenance
of their natural life, plants ([when divided]) are
able to survive. Animals are not, for they lack organs
for their preservation, wanting in some instances organs
for the seizure of food, and in others for receiving it into
the body, and in other instances wanting other organs in
7 addition to both of these. Such divisible animals

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[1] In the lower forms of animal life, as in vegetable life, organic functions are less centralized than in higher orders. In all of them, however, there is a certain amount of centralization, and even in insects life continues only a short time in any member after severance from the middle segment. Cf. above, 467*a* 20; *Hist. an.* 531*b* 30 ff.; *De an.* 411*b* 23.

[2] Ogle, in his translation of this tractate (London, 1897, p. 109) suggests for ἔχουσιν, ἐντόμοις. Cf., however, 479*a* 8, where we have the same use of τοῖς ἔχουσιν.

resemble a complex of several creatures grown together. In the most perfectly organized bodies, however, this phenomenon is not found, because their natures have been fashioned into the greatest possible unity. There are always, however, certain dissected members which exhibit slight sensation, because they are still under the influence of a certain psychical[1] affection. For after the entrails have been removed, bodily movements are still continued, as one observes in tortoises after the removal of the heart.

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[1] Aristotle knew nothing of the nature of reflex-movements, having no knowledge of the nervous system and regarding the heart and not the brain as the centre of psychical life. James (*Principles*, vol. i. p. 16) cites the case of Robin, who, on tickling the breast of a criminal an hour after decapitation, saw the arm and hand move towards the irritated point. Ogle (*op. cit.* p. 109) says that "insects, such as grasshoppers, from which the viscera have been entirely removed and replaced by cotton-wool as entomological specimens, if not pinned down, often fly away."

CHAPTER III.

We have further proof of the central situation of the
nutritive principle in the case of both plants and animals.
In the case of plants we observe their generation from
seeds, and we also note the phenomena of grafts and
2 slips. Generation from seeds takes place in every
instance from the centre. All seeds are bivalvular, and
the point at which their two halves are joined is the
point from which generation begins and the middle in
reference to the two parts. It is from this point that
stem and root shoot forth in growing plants, and the
3 point of origin is also the central[1] point. This phenomenon
may be observed in the case of the buds of
grafts and slips, for the bud is in a sense the life-principle
of the branch and at the same time its centre. It is the
bud, therefore, which one removes or into which one
inserts a graft, in order to produce branch or root from
it, on the theory that the origin of life in branch or root

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[1] Similarly Aristotle regards the heart or animal centre as the part in which life originates, and notices that it is visible in very small aborted embryos, and is observable in the egg on the third day (*De part. an.* 665*b* 1).

the centre. In sanguineous animals the first organ in 4
velopment is the heart. This is plainly seen in
ose animals whose process of generation admits of
servation. In bloodless animals the organ that
analogous to the heart must be the first de-
loped. We have already said in our earlier treatise, 5
the Parts of Animals,[1] that the heart is the organ
m which the veins proceed, and that the blood in
nguineous animals is the ultimate source of nourish- 469*a*
ent, out of which the members are generated.[2]
though regarding nourishment it is plainly the office 6
the mouth to perform one certain task, and the
ice of the stomach to perform another task, yet the
art is the master-organ and sets the end for all
e others. Consequently, in sanguineous animals it is 7
the heart that we must look for the origin of
trition and sensation. For regarding the preparation
food, the functions of the other organs are subordinate
the function of the heart. It must be true that
e master-organ is that which works persistently
wards the end and does not stop with that which is
bordinate to the end, just as a physician persistently
rks towards health. At any rate, the dominating 8
gan of sensation in all sanguineous animals is found
the heart, for the 'common sense' which serves all
e special senses must be situated there. There are
o senses, taste[3] and touch, whose channels lead mani-

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[1] *De part. an.* 665*a* 15.

[2] *De somno* 456*a* 34. Cf. also this tractate 469*a* 28 ff.; *De resp.* a 11; *De part. an.* 678*a* 7; *De gen. an.* 740*a* 21.

[3] Taste, as has been already said, is a sort of touch, and both taste and ch are connected with the heart by means of channels (πόροι), by

festly to the heart, and what is true of these must be true of the other senses. Movement in the other sense-organs may be transmitted to the heart, but with the upper parts of the body these two senses ([touch and taste]) do not communicate at all. 9 Apart from these considerations, if the life-principle in all animals is situated in the heart, the sensory principle must evidently be found there also. For that by virtue of which we call a thing an animal is the same as that by virtue of which we say that it lives, and the differential mark of sensation is the same as the differential mark of a living body. 10 The reason why certain senses are, as we see, connected with the heart and others with the head (in consequence of which some philosophers[1] regard the brain as the organ of animal sensation), has been given in a separate treatise.[2]

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which Aristotle probably understood the veins diffused through the flesh and leading to the central organ (*De part. an.* 656*a* 29). Their medium is elsewhere described as the flesh itself (*De gen. an.* 744*a* 1).

[1] Plato and Diogenes of Apollonia.

[2] *De part. an.* 686*a* 5 ff.

CHAPTER IV.

FROM what we have said, based on observed facts, it is clear that the principle of sensation, as well as that of growth and nutrition, is situated in this organ ([the heart]) and in the middle of the three divisions of the body. On[1] the basis of deduction we should say the same thing, because we see that nature, out of existing possibilities, does in every instance the best. Now, if each principle[2] is situated in the central section, the parts[3] (viz. that which finally elaborates the food and that which receives it) would thus perform in the best possible way their several functions. For to each of the parts the central organ will then be so related as is best, and the mid-position in a case such as this is the position

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[1] The editions of Bekker begin Chap. iv. here.

[2] Namely, the principles of sensation and nutrition.

[3] Aristotle's meaning appears to be that if the nutritive principle as well as the principle of sensation is lodged in the middle section, then the two parts of nutrition, viz. elaboration of food and its assimilation, would be best performed. In other words, the heart, as the organ of nutrition, would in this way be best placed for preparing food for distribution to the surrounding parts, and the surrounding parts, as receivers (τὸ δεκτικόν), would be best served by a centrally situated source of supply.

469 *b* that naturally belongs to a ruling principle. Again, one 2 must make a distinction between the user and the instrument used (and as they differ in function, so too, if possible, they should differ in position), as a flute and the hand that plays it are different in function and situation. If, then, to be an animal means to have the power of sensation, this power in the case of sanguineous animals must be found in the heart and in bloodless animals in 3 a corresponding organ. Every member and the entire animal body possess to a certain degree congenital heat. Consequently we see that during life animals are warm, but when dead and deprived of life they are cold. 4 The source of this heat in sanguineous animals must be sought in the heart, and in bloodless animals in the analogous organ. For all the organs (especially the dominating one) prepare and digest their food by means 5 of natural heat. Consequently, all the other parts of the body may become cold and yet life may continue, but when the master-organ becomes cold, life is destroyed entirely, because this is the source of heat for distribution to all other organs, and the soul is as it were suffused with fire in this organ, which in sanguineous animals is the heart, and in bloodless animals an organ analogous to the heart. 6 Life, then, must go hand in hand with the continuance of this heat, and what we call death is its discontinuance.

CHAPTER V.

THERE are two ways in which, as we see, fire may be
extinguished, viz. it may either go out or be put out.
In the former case we say the extinction is caused from
within, in the other case it is caused by opposing forces;[1]
an example of the former is old age; of the latter,
external violence. Extinction in both cases, however, is
due to the same ultimate cause, viz. the failure of fuel,
for when fuel fails and the heart can no longer receive
sustenance, extinction of the fire ensues. Cold, by 2
retarding digestion,[2] arrests nourishment. And there
are times when it extinguishes itself, as, *e.g.*, when the
heat is massed in too great quantity,[3] owing to lack of

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[1] In either case the extinction is due to the ascendency of cold over its contrary heat. Only in the former case, according to Aristotle, the extinction is due to the normal failure of fuel through exhaustion; in the latter case the extinction is due to unnatural or artificial exposure to cold or wet (which Aristotle calls opposing forces), thus abnormally checking the production of heat by the blood, and violently bringing the supply to an end.

[2] Digestion (πέψις) means 'cooking.'

[3] Excessive heat is here conceived of as too rapidly exhausting the supply of fuel, as in the case of fever or in old age (owing to its diminished supply of fuel). In addition to this the lungs in old age

respiration or lack of cooling. And when the heat accumulates in such mass, it soon causes an exhaustion of fuel, and this process of exhaustion takes place before
3 evaporation has time to develop. Not only, then, is a smaller fire extinguished by a larger one, but also the flame of a lamp is consumed within itself when immersed
470a in a large flame, just as any other combustible would be consumed. The reason for this is that the larger flame uses the fuel contained in the smaller before other fuel can take its place, and the fire continues in constant process of development and in constant flow like a river,
4 but we do not observe this on account of its rapidity. It is clear, then, that if the heat is to continue (and this is necessary if life is to continue), there must be some
5 means of reducing the heat in the chief organ. An illustration of this may be had in what takes place in quenched coals. For if coals are kept closely covered in a common oven, the fire is quickly extinguished. Whereas if one in rapid alternation removes a lid and
6 sets it on again, the coals continue lighted a long time. Covering a fire with ashes also keeps it. For owing to the porosity of the ashes ventilation is not prevented, and the ashes, by admitting the surrounding air, protect the fire against extinction through excess of heat arising in
7 it.[1] However, the explanation of the fact that opposite

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become dry and hard, and do not so well perform their function of regulating the temperature. Cf. *De respir.* 478*b* 35, 479*a* 7; *Meteor.* 379*a* 5; *De gen. an.* 783*b* 7.

[1] In other words, the surrounding air being admitted by the porous ashes prevents the excessive heat within from exhausting its fuel. Analogous to this is the reduction of the vital heat by the ventilation of the lungs.

effects are produced by covering a fire with ashes and with an oven-lid (for the latter extinguishes it and the former keeps it a long time) has been given in our treatise *On Problems*.[1]

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[1] The question is not discussed in the extant *Problems*.

CHAPTER VI.

SINCE every living thing has a soul, and the soul, as we
have said, cannot subsist without natural heat, we find
that in plants adequate provision has been made for the
preservation of natural heat through nutriment and the
2 surrounding air. For food produces refrigeration in
organisms when it is first introduced, just as on its
entrance it does in man. Whereas fasting creates heat
and produces thirst. For air, when it is stagnant, always
becomes heated, but when set in motion through the
admission of food it is cooled, until the food has under-
3 gone digestion. On the other hand, if the surrounding
air is excessively cold, owing to the season and the occur-
rence of heavy frosts, plants are dried up, or if intense
heat occurs in summer and the moisture derived from the
soil is inadequate for refrigeration, the natural heat is
extinguished and destroyed. In such seasons one says
4 that trees are frosted or suffer blight. And that is the
reason why people pile certain kinds of stones[1] about the

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[1] Whether any particular variety of stone was used for this purpose is, so far as I am aware, unknown. Presumably nothing more is meant than that such stones were used as lent themselves to making a compact

roots or cover them with vessels of water, in order to 470 *b* keep the roots of the plants cool. In the case of animals, since some of them are aquatic and others live in a medium of air, the refrigeration is derived from and through the media in which they live, *i.e.* in the one case water and in the other air. We must now begin a special inquiry touching the nature and manner of this process.

covering, thus shutting out the heat, or such stones as by their density were poor conductors of heat. In any case the chief idea is that they performed the same service as lungs and gills in animals, viz. the service of refrigeration or the prevention of excessive heat, as Aristotle supposes.

ON RESPIRATION.

CHAPTER I.

A FEW of the earlier physicists[1] have treated the subject of respiration. But in regard to the purpose which it subserves in the animal organism, some of them have given no explanation whatever, and others, although they have discussed it, have been wrong in their statements and have lacked empirical knowledge of the facts. Furthermore, they declare that all animals respire.[2] This, however,

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[1] Diogenes of Apollonia, who explained thought as well as life by means of respiration (Zeller, *Phil. der Griechen*, 4te Aufl. vol. i. p. 246), Empedocles (Burnet, *Early Greek Philos.* p. 230), Democritus (Zeller, *op. cit.* p. 810), Anaxagoras (cf. below 470*b* 20).

[2] Aristotle confined respiration to the admission and expulsion of air (480*b* 10). In modern Physiology, respiration in a wide sense includes that form of internal respiration (properly a function of nutrition), which means the interchange of oxygen and carbon dioxide between the cells and the fluid that drenches them (cf. *Ency. Brit.* Art. on "Respiration"). Ordinarily, however, it is used to signify the expulsion of carbonic acid and the admission of oxygen, which is effected mainly through the lungs, gills, skin, and alimentary canal. Pulmonary respiration is the chief means of working this interchange, and it is to this that Aristotle's opuscle is confined, referring to other means of respiration as only analogous functions.

is untrue. It will be necessary, therefore, to return to 2
these points, in order that we be not thought to make unfounded charges against writers who are no longer living. It is plain that all animals with lungs breathe. But amongst these, the animals that have a spongy, anaemic lung need respiration less than the others. Consequently they can remain, owing to their physical strength, a considerable time under water. All
oviparous animals have a spongy lung, as is the case in 3
frogs.[1] Again, water-tortoises and land-tortoises can remain a long time under water. In these animals the lung has little heat, because it has little blood. Consequently when it has been once inflated, it effects refrigeration by its motion and enables the animal to continue a
long time under water without breathing. Even in these 4
cases, however, when the animal is forced to hold its breath too long, it is suffocated. For none of these animals can inhale water, as fishes do. All animals, on the other hand, whose lung is full of blood, have greater need of respiration, because of their greater heat. As to the animals that have no lung at all, they have no respiration at all.

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[1] In the frog the cavity of the lung is divided into a honeycomb of chambers or alveoli. Each septum of the lung, being rich in elastic tissue and equipped with a minute network of capillaries covered on each side with epithelium, is freely exposed to the air, and owing to the honeycomb structure of the lung the area of exposure to the air (and consequent exposure of the blood) is great (cf. Foster, *Physiology*, 6th ed. p. 557). Birds exhibit a reptilian rather than mammalian form of lung (Owen, *Anatom. of Vertebrates*, vol. ii., p. 269).

CHAPTER II.

DEMOCRITUS of Abdera and certain other writers on the subject of respiration have not spoken definitely about the animals last named, but they appear to assert that all animals breathe. Anaxagoras, however, and Diogenes make the statement that all animals respire, and they say that fishes and oysters are endowed with
2 a sort of respiration. Anaxagoras declares that when
471 a fishes discharge water through their gills, they inhale the air that is developed in the mouth (for a vacuum does not exist), and so respire. Diogenes, on the other hand, says that when fishes discharge water through their gills, they inhale air by the action of the vacuum formed in the mouth, out of the water which surrounds the mouth, on the theory that water contains air.
3 These views, however, are untenable. For, in the first place, they leave out of account half of the truth, because their entire statement refers only to one aspect of the case. For by respiration one understands partly inspiration and partly expiration, and they have nothing to say in explanation of how the latter takes place
4 in lungless animals. And it is impossible for them

give any explanation. For when inspiration takes e, expiration must also follow by the same nnel as that employed in inspiration, and these two gs must succeed each other in constant alternation. consequence is that exhalation must take place at same moment that water is being received into the th, and in that case the one must impede the other meeting. Secondly, if they exhale by the mouth or at the moment when they discharge water, the sequence will be that inspiration and expiration will simultaneous, and, according to the above assertion, is the moment in which animals inspire. But simuleous inspiration and expiration is an impossibility. sequently, if it is true that respiration involves both iration and expiration, and if it is further true that atic animals are not capable of expiration, it is r that they are also incapable of respiration.

CHAPTER III.

AGAIN, the assertion that they inhale air from the mouth, or from the water through the mouth, is impossible. For aquatic animals have no windpipe, because they have no lung, but the stomach is immediately adjacent to the mouth, and consequently the stomach would necessarily be the organ of inspiration. But if this were true here, the stomach would have this power in other animals also. As a matter of fact, it does not have this power. Further, if aquatic animals were removed from the water they would then clearly show this
2 capacity to respire; but they do not show it. Furthermore, we observe in those animals that respire and inhale air a certain movement in the organ of inhalation. This is not observable in fishes. They appear to move no organ about the stomach other than the gills, whether they are in the water or are thrown gasping on
3 the dry shore. Again, when any respiring animal dies
471 b from suffocation in the water, its breath, as it forcibly leaves the body, is formed into bubbles, as one sees in the case of tortoises or frogs, or other animals of this sort, when they are forcibly drowned. With fishes,

however, this is not the case, whatever method one may use, because they contain no inhaled air. According to 4 the explanation of respiration above mentioned, it would be possible also for men to respire when in water. For if fish inhale air from water by means of their mouth, why should not men and other animals do the same thing? They should inhale air from the mouth quite 5 as much as fishes. If the latter have this power, the former should have it also. But as this is not true in the one case, it evidently does not hold good in the other. Furthermore, if fishes respire, why is it that we see them die in the air and gasp as if suffocated?[1] It is not owing to lack of food. The explanation given 6 by Diogenes is foolish. He says that fishes, when in the air, inhale too much air, and this is why they die, whereas in the water they inhale a moderate amount. But this should then be possible for land animals also. In point of fact, no land animal is suffocated by excessive inhalation. Further, if all animals respire, insects must evidently 7 respire also. Many of them, however, seem to live when they are divided, not only when divided into two parts, but into several, as in the case of the centipedes. How or by what organ is it possible for these 8 parts to breathe? The chief cause of the error of these writers was their ignorance of the internal organs, and also the fact that they did not grasp the truth of design in nature. For by asking to what end animals are endowed with respiration, and by making a test of their theory on the organs themselves, as, *e.g.*, on the gills and lungs, they would soon have discovered the real explanation.

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[1] Lewes (*Aristotle*, p. 176) says that the reason why fish die in the air was, when he wrote the note (1864), still awaiting an explanation. He was then not satisfied with the explanation of Flourens (*Annales des sciences naturelles*, 1830), which attributed suffocation to the collapse of the gills in the air, and the consequent inadequate aëration of blood, which no doubt is the chief cause, and Lewes' experiment in artificially separating the leaflets of the gills would not seem to be any adequate disproof. The number of respirations per minute in water has been experimentally investigated by McKendrick (*Journal of Anatomy and Physiol.* vol. xiv. 1879, p. 463) and found to vary in different fishes, ranging from 15 respirations (Rockling and Blue Wrasse) to 120 (Minnow and Stickleback). It is, however, no doubt true that rapid desiccation is a further cause of the dying of fish in the air, and the protection against this by the coat of slime on eels explains their living longer.

CHAPTER IV.

EMOCRITUS makes the statement, it is true, that respira-
on produces certain effects in the respiring animal, viz.
prevents the soul from being expelled from the body.
e by no means says, however, that nature in creating 472a
is function did so with this end in view. For he is,
the whole, like the other physicists[1] and makes no
plication of any such causality. He maintains that the 2
ul and heat have one and the same nature, viz. they are
emental spherical atoms. Consequently, when these are
mpressed by the force of the surrounding air, inhalation
mes to their assistance. For in the air there is a large 3
imber of the atoms which he calls mind and soul. In
e act of inhalation, then, and along with the entrance
the air, these atoms also enter, and, by counteracting
e pressure, prevent the expulsion of the soul that
sides in the animal body. It is for this reason that 4
e and death depend upon inspiration and expiration.

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[1] We are almost entirely dependent on this account of Aristotle for
eories of respiration amongst the Presocratics. For the theories of
len and Hippocrates see the article of Steinheim, "Antike Lehre d.
hmens" in *Litt. Ann. d. gesamm. Heilkunde*, vol. x. (1828), p. 257 ff.

For when the surrounding medium by its pressure gains control and the outer air is no longer able to enter and counteract this control, respiration in the animal becomes impossible and death ensues. For by death one means the departure of these psychical atoms from the body due
5 to expulsion by the surrounding medium. The reason, however, why death necessarily comes at all to every animal, and why it does not come at any chance period, but in the course of nature only in old age,—a violent death is contrary to nature,—he has not in the least explained. And yet, because this phenomenon occurs evidently at one period and not at another, it behoved him to explain whether it is due to an external or to an
6 internal cause. Further, he has not a word to say regarding the origin of respiration, whether its cause is external or internal. And yet it is evidently not the external mind that comes to the rescue here, but the principle of respiration and of respiratory movement is due to an internal cause, and we are not to suppose that the force of the surrounding medium is any explanation. It is also absurd to think that the surrounding medium has at once the effect of extinguishing by compression, and on its entrance the opposite effect. The foregoing, in content and manner of statement, conforms closely to
7 the theory of Democritus. If one is to regard as true what was said a while ago, viz. that not all animals respire, then we must regard the Democritean explanation of death as not universally applicable, but only to those cases where animals breathe. But even to these cases it does not well apply, as is evident from facts observed by
8 all of us. For in warm weather, when we are more than

heated, we have greater need of respiration and breathe more rapidly. When, however, our ment is cool and contracts and chills the body, l our breath. This is the very moment, however, 9 e air from without should enter and prevent the xpulsion. In point of fact it is the opposite that 472 b lace. For when excessive heat is accumulated, to its not being exhaled, that is the moment we spiration, and inhalation is necessary to this. The s, men breathe rapidly when they are hot, because ion has a cooling effect, at the very moment according to the theory of Democritus]) they would se a proverb, 'adding fire to fire.'[1]

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[1] se Democritus regards the soul-atoms as identical with the ns.

CHAPTER V.

THE theory of circular push described in the *Timaeus*[1]
gives no explanation whatever of the way in which heat
is maintained in animals other than man, whether the
preservation of heat in the various animals is due to the
same or different causes. For if the phenomenon of re-
spiration is found in land animals alone, we must explain
why they alone breathe. If, however, it occurs in other
animals also, but by a different process, assuming that
they can all respire, we must find an explanation for the
2 difference in process. Furthermore, the whole manner
of explaining the phenomenon is fanciful. For Plato
says that by the issuance of hot air from the mouth,
the surrounding air is pushed forward and is transmitted
through the pores of the flesh, and rests at the point
from which the internal hot air issued. These elements
thus effect a complementary displacement, owing to the
fact that a vacuum is impossible. In the same way the

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[1] *Timaeus*, 79 A ff. Plato's explanation of the circular movement of inspiration and expiration is expressly applied by him to the lowering of animal heat, and not only in man but in all animals, as he says, "in the interior of every animal the hottest part is that which is around the blood and veins" (*Timaeus*, *loc. cit.*).

nhaled air in turn, when heated, is discharged and the
warm air within, issuing out through the mouth, continues
his 'circular push.' And so this process, which is inspira-
ion and expiration, goes constantly on. The logical 3
consequence of the theory is that expiration precedes
nspiration, whereas the opposite is the fact, as the
following proves. The two things are correlated
phenomena. Now man's last act is expiration, conse-
quently inspiration must form the beginning. Further, 4
the end which these processes (I mean inspiration and
expiration) subserve in the animal body is not taken into
account at all by the philosophers who advocate this
theory. They treat them merely as unessential phe-
nomena. We see, however, that they are the master-
factors in life and death. For when a breathing animal
is unable to respire, at that moment death ensues.
Further, it is absurd to suppose that the issue of hot 5
air through the mouth and the entrance of air again
by the mouth should be observable by us, whereas
the entrance of the breath into the thorax and its
discharge should not be observable.[1] It is also strange
that respiration should mean the introduction of
heat.[2] Observation shows the contrary, for expired air is 6
hot, whereas inspired air is cool. And when the
atmosphere is warm animals pant in respiring and they
draw their breath frequently, because the entering air 473a
does not adequately cool them.

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[1] That is through the pores into the thorax.

[2] Respiration to Plato means the introduction of heat only in so far as it means the maintenance of heat and the supply of fuel (*Timaeus*, 79 E).

CHAPTER VI.

WE must also reject the theory that the purpose of
respiration is nutrition, which presupposes the feeding
of internal heat by means of the breath. According
to this view, inspiration is similar to throwing fuel on a
2 fire, and expiration follows when the fire is fed. We
again urge the same objections to this theory as we did
to the theories enumerated above. The same process,
or something analogous to it, should be found in all
3 animals, for they all have vital heat. In the next place,
the advocates of this theory should explain how heat is
generated out of the breath. The whole view is fanciful.
According to our observation generation of heat is due
much rather to food. A further consequence of their
theory is that food is received and excrement discharged
at the same orifice,[1] which is not seen in any other
instance.

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[1] The reference may be to the Pythagoreans (cf. *De sensu* 445a 16), who asserted that certain animals are fed by the inspiration of smells. But we have no details about their doctrine. Inasmuch, however, as food here appears to be fuel for vital heat, the reference to Plato is possible, who in the 'circular push' theory would seem to admit food and discharge waste by the same orifice.

CHAPTER VII.

Empedocles also has a theory of respiration, although he does not explain the purpose of respiration, nor does he say definitely whether all animals are endowed with respiration or not. In treating of respiration through the nostrils, he fancies he is dealing with the main factor in this process. He is here mistaken, 2 for there is respiration through the windpipe, which leads from the chest, as well as respiration through the nostrils, and without a windpipe the nostrils themselves could not respire at all. Animals may even be deprived of respiration through the nostrils and suffer no harm, but if the use of the windpipe is shut off they die. In certain animals, indeed, respiration through the nostrils is employed by nature for the secondary function 3 of smell. Although almost all animals are endowed with the sense of smell, they do not all employ the same organ for this purpose. On this subject, however, we have spoken elsewhere more in detail.[1] 4

Empedocles asserts that inspiration and expiration take 473 *b* place through particular veins, in which there is blood, although they are not entirely filled with blood, and that these veins are provided with channels that lead into the outer air, channels which are too minute for the admission of crass matter, but large enough for air. Now, the blood is so constituted as to move up and down, and after its downward motion the air streams in and inspiration takes place; on its upward motion expiration into the outer air ensues—a process which resembles what we observe in the Clepsydra :[1]

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[1] Cf. *De an.* 421*a* 7 ff.; *De sensu*, 444*b* 16.

5 Thus all things breathe and breathe out air again.
Long bloodless tubes the body's surface reach,
And at their close-packed vents are nostrils fixed
Pierced through ; and so a passage way is cut
For air, while yet the blood is hidden held.
When yielding blood along these channels ebbs,
Then bursts the surging air with tempest's wave
Within. But when the blood rebounds, the air
Is then expired again, as one may see
A child with smooth bronze water-clock at play.
Upon her comely hand she sets the tube,
And dips it in the yielding water's sheen,
Of which no drop slips in the vessel's form.
Upon the close-packed vents the air doth press
Within, until the maid her hand removes
And frees the urgent stream, which entrance makes,
Whose even flow drives back the yielding air.
So, too, when e'er the waters full free flow
Hath filled the deep bronze tube, and maiden hand
The passage firm hath blocked, then doth the air,
The eager outer air, the vents make fast
And hold in its restraint the inner stream
Whose waters at the narrow gates complain,
474 a Until the maiden lifts her hand. And now
Is true the converse of what was before :
The air flows in—the water's equal stream

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[1] Burnet (*Early Greek Philos.* p. 230) gives a valuable elucidation of this passage.

Flows out. Thus also 'tis with fluent blood
That coursing through our limbs now hurries back
To inner depths, and straightway air pours in
With surging swell. Again the blood returns
From its retreat; then forthwith yields the air,
Exhaled once more, in nature's even course.[1]

These are his words on the subject of respiration. As 6 we have already said, animals that visibly respire do so by means of the windpipe as well as by means of the mouth and nostrils. Now, if Empedocles is speaking of respiration in this sense, we must inquire how far his explanation harmonizes with the facts. Apparently the facts contradict his theory. For in inspiration the receptacle is 7 expanded like a brazier's bellows. Expansion, however, is naturally explained by heat and by blood which takes the place of heat ([but it is not explained by air in the theory of Empedocles]). In expiration, on the other hand, contraction and collapse take place, as in the bellows, excepting that the cases are not quite parallel in this respect, viz. the bellows do not admit and discharge air by the same orifice, whereas in inspiration and expiration the same orifice is used. If, however, he is here 8 referring merely to respiration through the nostrils, he is quite wrong. For respiration is not a function which is peculiar to the nostrils; on the contrary, along the passage near the uvula, at the extreme end of the roof of the mouth, part of the air passes here through the openings of the nostrils and part of it through the mouth, and this applies equally to inspiration and expiration.

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[1] *Vid.* Fragments of Empedocles in Mullach's *Fragmenta Philos. Graec.* (Paris, 1883), vol. i., pp. 10, 11.

CHAPTER VIII.

IT was said above that life and the possession of soul are accompanied by a certain degree of heat.[1] For even the process of concoction, by which food is prepared for animal life, cannot be accomplished without soul and
2 heat; all this is effected by fire. Consequently, such a fundamental process as this must be situated in the primary region of the body and in the primary organ of this region, and here it is that we must look for this
474 *b* elementary nutritive soul. This is the middle region between the orifice for admitting food and that for discharging excrement. In bloodless animals the primary organ has no name, in sanguineous animals it is the heart.
3 The food out of which animal members are generated is the blood. The blood and blood-vessels must have the same starting-point. For the one, as vessel and receptacle exists for the other. The originating point for these vessels in sanguineous animals is the heart. They do not
4 traverse the heart; they all issue from it and are

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[1] Even plants, Aristotle correctly remarks (although he gives no reason for the statement), exhibit vital heat (*De part. an.* 650*a* 6; *De vit. et mort.* 470*a* 22).

attached to it, as is evident from dissection.[1] Now, the other functions of the soul cannot be performed independently of the nutritive principle (the reason for which has been stated in the treatise *On the Soul*),[2] and the nutritive principle in turn cannot subsist without natural heat. For it is through natural heat that nature has endowed the nutritive principle with warmth. Fire may be destroyed, as we said before, in two ways: by extinction and by exhaustion. Extinction is effected by opposing 5 forces. Consequently even when the fire is massed it may be extinguished by environing cold, and when scattered it is more easily quenched. This extinction by external force applies to animal heat as well as to inanimate fire. For animals die when dismembered by instruments or when congealed by excessive cold. Exhaustion, on the 6 other hand, follows from excessive heat. For if the surrounding heat is great, and the internal supply of fuel is not maintained, the fire ceases to burn, not from extinction by cold, but from exhaustion. Consequently there must be some cooling process, if survival is to be attained; for this comes to the rescue and prevents extinction.

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[1] There is no doubt that Aristotle practised dissection of animals, although he probably never dissected the human body. His conclusions in reference to the latter were drawn from the anatomy of other animals, whence also the Asclepiads derived their knowledge, and his errors are such as are due to this source of information and to his speculative views as to anatomical structures (*e.g.* the bloodlessness of the brain, its not extending to the back part of the skull, and its function as a cooling apparatus). Further, the feelings of the Greeks regarding the sacredness of the human body were much stronger than ours, and neither Hippocrates nor Galen is supposed to have dissected man. Cf. *Hist. an.* 494*b* 22, 513*a* 12; Huxley, *Nature*, vol. xxi.; Lewes, *Aristotle*, p. 165.

[2] *De an.* 416*a* 10 ff., 434*a* 22.

CHAPTER IX.

SOME animals are aquatic and others have their existence
on the dry land. In the case of the very small and
bloodless specimens of both classes, the cooling produced
by their surroundings, whether air or water, is adequate
to protect them against the above-mentioned extinction.
For being endowed with little heat they need little
protection. Animals of this kind are, consequently, in
2 the rule short-lived, for a slight change on one side or
475a the other destroys the balance. The longer lived insects
(which, like all insects, are bloodless[1]) have a fissure just
below the middle part in order that cooling may be
effected through the membrane, which at this point is
very thin. For inasmuch as they have more heat they
have more need of cooling. Bees, for example, some of
which live as long as seven years, and the other insects
3 that hum, such as wasps, cockchafers, and locusts, belong to
this class. They produce this noise by their breath, as if

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[1] The blood of insects is ordinarily a colourless liquid, sometimes yellowish or greenish, and rarely red, and was not regarded by Aristotle as blood. Cf. Owen, *Compar. Anatom. and Physiol. of Invert. An.* p. 383.

by panting. As the natural breathing within rises and falls, it produces friction against the membrane in the middle region. For insects keep this region in motion just as animals that breathe the outer air[1] maintain motion by their lungs or fishes by their gills. This 4 motion is similar to what would take place if one should suffocate a respiring animal by holding its mouth; for then this swelling movement would be produced by the lungs. In the latter case, however, such motion is inadequate for cooling, although it is adequate in the 5 case of insects. By means of friction against a membrane they produce a humming noise, as we said, in much the same way as children make a noise through a perforated reed after stretching a thin membrane in it.[2] And it is in this way, too, that the singing locusts produce their song. They possess greater heat than other varieties, and have a fissure in the middle region. In the songless locusts this fissure is lacking. Sanguineous animals endowed with 6 lungs that contain little blood and are spongy, can live a long time without respiration, because the lungs are capable of great expansion, containing as they do little blood or fluid. Consequently, their own peculiar

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[1] All insects breathe air, which enters chiefly through the thoracic and first abdominal spiracles. In the case of insects living in the water respiration is effected by branchiae or false gills, which are supposed to absorb air from the water. Cf. Packard, *The Study of Insects*, p. 40; Owen, *Compar. Anatom. and Physiol. of the Invert. An.*, p. 368.

[2] Insects produce sounds by the vibration of their wings, by the vibration and friction of the abdominal segments, and by rubbing the head against the anterior wall of the thorax. The shrilling of the male cricket (a sexual call) is produced by the friction of the fore wings against the hind wings (cf. Packard, *The Study of Insects*, pp. 362, 563). Aristotle further describes the methods by which insects produce sounds in the *Hist. Anim.*, 535*b* 4 ff.

motion is adequate for cooling through a considerable
7 period. Finally, however, it is unable to continue this,
and without respiration it suffocates, as we said before.
That form of exhaustion which consists in destruction
through lack of cooling is called suffocation, and animals
that die in this way are said to be suffocated. We have
8 already remarked that insects do not respire. One can
observe this plainly in the case of small insects, such as
flies and bees, for they can swim a long time in a liquid,
475 *b* provided it is not too hot or too cold. And yet animals
which have less strength require more frequent respira-
9 tion. They are destroyed, however, and are suffocated,
as we say, when the belly is filled with water and the
heat of the middle region quenched. From this we can
understand how it is that such insects get up again after
being covered for some time with warm ashes. We also
10 observe that bloodless aquatic animals live in the air
longer than do sanguineous animals that take in sea-
water, as the fishes. For the former have little heat, and
consequently the air is adequate to cool them for a
considerable time, as is the case with crustacea and
11 polyps. And yet it is finally inadequate for life, because
they possess little heat; for even fishes are often dug out
of the earth and found to be living, although motionless.
Animals that are endowed either with no lungs at all or
with lungs containing little blood, need the least frequent
respiration.

CHAPTER X.

In regard to bloodless animals we have said that some of them owe their survival to the surrounding air, others to the water. In the case of animals that have blood and a heart, all those that are provided with lungs take in air and effect cooling by means of inspiration and expiration. Now, viviparous animals are 2
provided with lungs, not those, however, that bear their living young outside of themselves (for the cartilaginous fishes are viviparous, but not within their own bodies[1]), and amongst oviparous animals those that have wings are provided with lungs, as, *e.g.* birds, and further, such animals as have scales, like the tortoises, lizards, and snakes. Viviparous animals have a lung well 3
filled with blood, whereas most of the oviparous animals have spongy lungs. Therefore, as we said before, the latter need less frequent respiration. All of them, however, 4
do breathe, even those that live and maintain their existence in the water, such as hydras, frogs, crocodiles,

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[1] Mammalia are Aristotle's "internally viparous." By "externally viviparous" he means the ovoviparous, which are without placental attachment.

fresh-water tortoises, tortoises of the sea and land, and seals. For all of these animals, and others similar to them, bear their young on the land, and sleep either on land or in the water with their mouths above the surface
476 *a* for respiration. Animals, on the other hand, that have
5 gills, are cooled by taking in water. To this class belong the cartilaginous fishes and other apodous animals, including all fishes. For their organs of locomotion are after the analogy of wings ([rather than feet]). Amongst animals that have feet, only one, so far as has been
6 observed, has gills, viz. the tadpole, as we call it. But no case has ever been seen of the possession of lungs and gills together. The reason is that the lungs are designed for cooling by the admission of air (even the name *πνεύμων*, 'lungs,' seems to have been derived from their reception of *πνεῦμα*, 'air'), and gills are designed for cooling by the admission of water. But only one organ is used for one purpose, and one method of
7 cooling is adequate for each animal. And so, since we know that nature makes nothing in vain, and since one of these two organs would be useless, some animals are provided with gills and others with lungs, but no animal with both.[1]

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[1] Ogle (*op. cit.* p. 125) points out that Aristotle cannot have been acquainted with the Dipnoi or Amphipneusta, in both of which groups gills and lungs co-exist.

CHAPTER XI.

INCE every animal needs food for its subsistence and
ooling for its persistence, nature employs for these
wo purposes one organ.[1] And as in some animals
he tongue is employed for the double purpose of tasting
nd communicating thought, so in those which are
rovided with lungs, the mouth serves for the masti-
ation of food as well as for inspiration and expiration
f air. In those, on the other hand, that have no 2
ungs and do not respire, the mouth serves for the
astication of food, but gills are provided for cooling
here cooling is needed. In what way the functioning
f the aforesaid organs effects cooling, we shall explain 3
ater. In order not to hinder the admission of food,
similar method is employed by respiring animals and
y those that take in water. For in the former case
hey avoid respiring and swallowing their food at the
ame instant, otherwise they would choke by admitting
iquid or solid food into the lungs through the windpipe.

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[1] Cf. *De part. an.* 659*a* 22, 683*a* 19 ff. Elsewhere Aristotle refers lso to the nostrils as organs subserving respiration. *De part. an.* 40*b* 15, 659*a* 30. Cf. also above 473*a* 17 ff.

For the windpipe lies in front of the oesophagus, through which food finds its way into the stomach. In the 4 sanguineous quadrupeds the windpipe is provided with a sort of lid called the epiglottis. In birds and ovi- 476 *b* parous quadrupeds, on the contrary, there is no such lid, but they attain the same end by contracting the windpipe.[1] When food is being swallowed, the ovipara contract the windpipe, whereas the vivipara close the 5 epiglottis. And after the food has passed, in the one case the windpipe is expanded, and in the other the epiglottis is opened, and air is admitted for the purpose of cooling. In regard to those animals that are provided with gills, they discharge the water through these and then admit food through the mouth. They have no windpipe, so that they can suffer no harm by the wrong discharge of water into it, but only by 6 the entrance of water into the stomach. For this reason, the discharge of water and the swallowing of food is done rapidly, and their teeth are sharp, and in almost all instances are serrated, for they cannot chew their food.

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[1] In the mammalia food is prevented from passing into the windpipe during deglutition by the epiglottis, which is possessed by no other animals, while in other vertebrates this function is performed by the closing of the larynx through muscular constriction (*De part. an.* 664*b* 22). Cf. also *Hist. an.* 535*a* 29 ff. and *De an.* 420*b* 29, where the functions of these organs in speech are treated.

CHAPTER XII.

REGARDING the cetaceous aquatic animals, such as dolphins, whales, and such others as have what is known as a spout-organ, one might feel some doubt, yet even these conform to our theory. For they are apodous, and although they have lungs they take in sea-water. The ground for this apparent exception is given in the foregoing explanation; for the end to which they take in water is not cooling. 2
This is produced in their case by means of respiration, for they have lungs. Consequently, they sleep with their mouths above the water's surface, and dolphins, it is certain, snore. Again, when they are caught in nets, they soon suffocate from lack of respiration. It is in order to breathe, then, that we observe them lying on the sea's surface. Since, however, they are forced to take their food in 3
the water, they must on swallowing discharge the water, and for this reason they are all provided with a spout-organ. When they have taken in water they discharge it through this spout-organ, just as fishes do through their gills. A proof of this fact is the position of the spout-organ. It 4
does not lead to any of the blood-filled organs, but is situated in front of the brain and discharges the

water[1] here. For the same reason the molluscs and crustaceans admit and discharge water. I mean the sea-crayfish and crabs, as we call them. They make no use of it
5 for cooling, for they are endowed with only a small amount of heat and are in every case bloodless, so that they are
477a kept cool enough by the surrounding water. But it is discharged on account of their food, viz. in order that the water may not enter at the moment of swallowing. The
6 crustaceans, such as the sea-crayfish and crabs, discharge the water through the plaited folds along their shaggy covering; the purple fish and polyps discharge it through the hollow passage above the head. These
7 questions have been treated with greater detail in the *History of Animals*.[2] Concerning the phenomenon of the admission and discharge of water, we have said that it is due, in certain cases, to the need of cooling, and in others to the fact that aquatic animals are obliged to swallow their food in the water.

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[1] Ogle (*op. cit.* p. 127) cites Cuvier (*Règne animal*, i. 285) as giving the same explanation of the purpose of the blowhole, and says it is still the popularly received, although erroneous, view. Its actual use is to provide an additional safeguard (besides the epiglottis) against the entrance of water into the air passages.

[2] *Hist. an.* 525a 30 ff.

CHAPTER XIII.

WE must next describe the method by which cooling is effected in respiring animals and in those provided with gills. We have already said that animals which have lungs respire. As to the reason why some animals have 2
this organ and why those that have it need respiration, it is because the higher order of animals are endowed with greater heat. At the same time it must be that they are endowed with a higher order of soul. For such beings are of a higher order than plants. Consequently, animals 3
whose lungs are more abundantly supplied with blood and heat are of greater bodily dimensions than others; and the animal that is supplied with the purest and most abundant blood, *i.e.* man, is the most erect of all animals, and his upper structure points to the upper region of the universe—true of him alone—because he has lungs constituted as we have described. The essential character both of man and of other animals must, therefore, be ascribed as much to this as to any other organ. This, 4
then, is the purpose of the lungs. One must suppose that the material conditions and moving cause have constructed these animals in this way, as they have also operated to

produce other animals with a different constitution. For some are composed chiefly of earth, like plants, others chiefly of water, like aquatic animals. And amongst the winged and terrestrial animals, the one class is composed chiefly of air and the other of fire. And they severally have their place in regions akin to their own natures.

CHAPTER XIV.

MPEDOCLES[1] was wrong in saying that the aquatic nimals are warmest and contain most fire, and, being 477 *b* efective in cold and fluid, they seek refuge from onstitutional excess of heat in a medium to which heir nature is opposed. For water is cooler than air. t is, however, altogether unintelligible how animals born 2 n dry land can change their place of abode to water. or they are, in almost all cases, apodous. And yet, hen speaking of their primary constitution, he asserts hey are born on the dry land and later leave this and nigrate to the water. Again, our observation shows 3 hat they are not warmer than land animals; for some f them are absolutely bloodless, while others are almost

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[1] The writings are no longer extant from which Aristotle derived ese views of Empedocles. Lucretius, who was a follower of picurus, and an admirer of Empedocles (cf. *De rer. nat.* i. 66, 716 ff.), ives expression to the same view (*De rer. nat.* v. 793), that land nimals cannot have migrated from water (*salsis lacunis*) to the land; n the contrary, all animals are land-born (*a terra quoniam sunt cuncta eata*). The theory of Empedocles was allied to the ancient myth of e Autochthons. Anaximander, on the contrary, taught the evolution animals from the moist element under the influence of the sun's eat (Ritter and Preller, *Philos. graec.* p. 19*a*).

so. But what kind of animals we should call warm and
what kind cold, is a subject itself that requires investigation.
Regarding the explanation given by Empedocles,
his contention is, in a certain sense, correct, although
4 what he says is not entirely true. For it is true that
regions and seasons which exhibit characteristics opposed
to abnormal conditions in animals tend to preserve them,
and yet their normal nature is best preserved in a place of
abode similar to their own constitution. For the matter
out of which animals are severally constituted must not
1 be confounded with the varying states and conditions of
5 this matter. I mean, *e.g.* if a thing were formed of
wax or ice, its preservation would not be secured by
placing it in a hot environment. For, owing to the
opposed nature of its surroundings, it would be quickly
destroyed, for heat melts that which consists of the
contrary nature. Again, if a thing were composed of
salt or nitre, nature would not carry it and set it down
in a wet environment, for water dissolves substances of a
6 warm, dry constitution. If, therefore, the fluid and solid
constitute the matter out of which all bodies are formed,
it is reasonable to suppose that fluid and cold structures
will be found in a moist environment; solid structures,
on the other hand, in a solid environment. Consequently,
trees do not grow in water, but in the earth; although,
7 according to this same theory of Empedocles, they should
migrate to the water, because of their being predominantly
dry, or, to use his expression, "predominantly fiery."
This migration would be to water not because it is cold,
but because it is fluid. The natural constitution of
matter, therefore, conforms to the environment in which

it is found—the moist, *e.g.* is found in water, the warm 8
in the air. Acquired conditions, however, are better 478*a*
regulated through an opposite environment, excessive heat through cold surroundings, and excessive cold through warm surroundings. For the environment reduces the excess in these conditions and brings them to an equable mean. This reduction is to be sought in an environment adapted to the particular constitution of the thing and in the variations of ordinary climate. For acquired conditions may be opposed to the place of abode, but this is impossible in the case of the original constitution.

Touching the theory of Empedocles that animals are 9
divided into aquatic and land animals on the basis of differences in natural heat, and touching the explanation of the phenomenon that the one class has lungs and the other not, let the foregoing discussion suffice.

CHAPTER XV.

THE reason why animals with lungs can take in air and respire, especially such as have lungs well filled with blood, is to be found in the fact that the lungs are porous and filled with tubes. The lungs contain more blood than any other organ in what we call the viscera.
2 Animals whose lungs are abundantly supplied with blood need rapid refrigeration, because of the delicate balancing of the natural heat, and because the cooling process must penetrate through the entire interior, owing to the great supply of blood and heat. Air can easily meet both these demands. For owing to its rarity, it rapidly penetrates everywhere, and effects cooling.[1] This is not
3 true of water. It is also plain from this why it is that animals which have lungs well filled with blood breathe best. It is due to the fact that the warmer the nature the greater is the need of cooling, and at the same time that the air fills the lungs, it passes readily to the original source of animal heat in the heart.

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[1] Empedocles and Plato supposed that the air penetrated through the pores of the skin, which in their theories became channels of ventilation.

CHAPTER XVI.

THE way in which a passage is made between heart and lungs must be studied through dissection, and in the *History of Animals*.[1] Animal nature, in general, needs cooling, because of the vital fire in the heart. This is accomplished by means of respiration, excepting in those cases where animals are provided with a heart only but no lungs. When they have a heart but no lungs, as is 2 the case in fishes, whose natural abode is water, cooling is attained by water through the use of the gills. In regard to the relative positions of heart and gills, one must study them ocularly in dissection and their nicer philosophy in 478 b the *History of Animals*. To give a summary description, however, the case is as follows: One might suppose 3 that the position of the heart in land and aquatic animals was different; as a matter of fact, it is the same in both. For the direction in which the animal's head naturally inclines is the direction in which the heart's apex is turned. But inasmuch as the heads of land animals do not incline in the same direction as

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[1] Cf. *Hist. an.* 496*a* 5 ff., 511*b* 24, where an historical account of theories regarding the anatomy of the blood-ducts is given.

those of aquatic animals, the heart's apex in the latter
4 case is turned towards the mouth. A sinewy vein-like
tube extends from the extremity of the heart[1] to a
central point, where all the gills are united. This is the
largest of all the tubes, but there are others on each side
of the heart which extend to the several extremities of
the gills, whereby cooling is produced and transmitted
to the heart, the water being constantly piped through
5 the gills. The rapid swelling and falling motion of
the thorax in inhaling and exhaling air serves the same
purpose in respiring animals that the movement of gills
does in fishes. Respiring animals suffocate in a small
quantity of air that remains unchanged; for each medium
([water as well as air]) soon becomes hot, and contact
6 with the blood heats them. When, however, the blood
becomes hot, the process of cooling is impeded. Also
when respiring animals become unable to inflate their
lungs, or aquatic animals to move their gills, whether
owing to disease or to the weakness of old age, their
end must be at hand.

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[1] The aortic bulb, which Aristotle took to be the heart's apex.

CHAPTER XVII.

IRTH and death are phenomena common to all animals,
though there are specific differences in their modes of
ccurrence. Death is not everywhere the same, although
i its varied forms there is a common element. Death
ssues from violence or from the ordinary course of nature.
eath is violent when due to an external cause, natural
hen due to internal processes. The latter conforms to
ie original organic structure, and is not an adventitious
ondition. In plants this process is called decay; in 2
nimals, senility. Death and decay attach to all organ-
sms alike that are complete, and to the incomplete also,
ut in a different way. Under incomplete, I understand
uch things as eggs, and seeds of plants which as yet
ave not taken root. Death is caused in all things by
ack of heat; in complete organisms by its failure in that
art where the vital principle is lodged. This principle 3
s lodged, as we said above, in the middle region, where
he upper and lower parts are conjoined. In plants it is
he point at which stem and root unite; in sanguineous
nimals, it is the heart; in bloodless animals, in an organ 479a
nalogous to the heart. In some of the bloodless animals

we find many vital centres potentially, though not
4 actually. For this reason certain insects, when divided,
continue to live, and such sanguineous animals as are not
highly organized live a considerable time after the removal
of the heart, as is true of tortoises. Tortoises continue to
move their feet[1] so long as their shell is not removed,
because their organization is of a lower order, resembling
5 in this respect the insects. The vital principle succumbs
in its possessor when the heat which is its accompaniment
is not reduced by cooling. For otherwise, as we have
6 often remarked, it is consumed by its own agency. When,
therefore, the lungs or gills respectively become hardened,
or dried up and earthy through lapse of time,[2] it is
impossible for these organs to function, to dilate and
contract. And finally, when a further demand is made
7 upon them, the fire of life is extinguished. Consequently,
death quickly ensues in old age, even on the appearance
of trivial ailments. This is due to the fact that
there is little heat left in old age, most of it having
been exhaled in a long life, and if any extra strain
is put upon the lungs, life is speedily quenched.
For the fire within, being now but a tiny feeble
8 flame, is extinguished by a slight movement. That is
also the reason why death in old age is painless, for
death comes to the aged with no element of violence
in it, rather the dissolution of the soul occurs quite
9 without their feeling it. Diseases which make the lungs

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[1] Ogle (*op. cit.* p. 132) points out that this passage shows that Aristotle occasionally vivisected animals, and cites the following passages: *Hist. an.* 503*b* 23; *De gen. an.* 765*a* 26, 774*b* 31.

[2] Or through the hardening (by drying) effects of fever or accretions of matter on the lungs' surface.

l, whether by tubercles or deposits or by excessive bid heat, as in fevers, produce an acceleration of the thing, because the lungs are incapable of full expansion contraction. And finally, when motion is no longer ible, men exhale their breath and die.

CHAPTER XVIII.

[illegible]

BIRTH, then, is the original suffusion of the nutritive soul
with heat, and life is the maintenance of this heat.
Youth is commensurate with the growth of the primary
organ of cooling, old age with the wasting of the organ,
and the prime of life with the middle period between the
2 two. Death and violent destruction mean respectively
the exhaustion[1] and extinction of the vital heat (for it is
479 *b* destroyed from both causes); exhaustion is given in the
nature of the thing itself, and is caused by lapse of time
3 and by the completion of a normal term of life. In
plants this is called decay; in animals, death. Death in
old age is due to the exhaustion of the organism that
comes from senile inability to effect cooling. We have
now explained the meaning of birth, life, and death, and
have treated the causes of these phenomena in animals.

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[1] Extinction (σβέσις) is violent or artificial; exhaustion (μάρανσις) is natural or due to the inherent nature of the thing itself. Cf. *De vit. et mort.* 469*b* 23; *De resp.* 474*b* 14.

CHAPTER XIX.

FROM these considerations one may clearly see why it is that respiring animals are suffocated in water, while fishes are suffocated in the air.[1] For in one case cooling is effected by the medium of water; in the other by that of air, and both of them are deprived of this by the change in their place of abode. We have further to 2 explain the movement[2] in gills and lungs respectively,—exhalation and inhalation in the one case, and the admission and discharge of water in the other. We have also to explain the structure of the organ of respiration in what follows.[3]

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[1] *Vid.* note 1, p. 291.

[2] *i.e.* by the movements of these organs the cooling medium (air or water) is admitted to the organism and the temperature regulated.

[3] The explanation follows in Chapter xxi. Ogle (p. 132) considers Chapter xx. an interpolation.

CHAPTER XX.

THERE are three phenomena regarding the heart, which might be supposed to have the same nature, but are different, viz. palpitation, pulsation, and respiration.
2 Now, palpitation is a compression of heat in the heart, owing to cooling in other parts of the body produced by excretion or waste, such as we see in the disease called palpitation of the heart, as well as in other diseases, and in fear also. In fear the upper regions of the body are cold, and their heat is discharged and collected in the heart, where palpitation is caused, and the heat being thus compressed into a small space, it sometimes happens that animals are suffocated and
3 die from fear and its morbid conditions. The phenomenon of pulsation, however, that occurs in the heart, and which, as we see, is a constant process, is similar to the throbbing in an abscess. In the latter the movement is painful owing to abnormal change in the blood. This process continues to a point where the blood is
4 concocted and converted into pus. The condition is analogous to boiling. For boiling takes place when water is evaporated by heat, and it bubbles up owing to

its increase in volume. The development of abscesses
is arrested when the pus is not evaporated and the liquid
becomes very thick; the process in boiling is arrested 480 *a*
when the confining vessel is overflowed. The supply of 5
moisture derived from food and its expansion through
heat produces pulsation in the heart,—the expansion
extending to the heart's outer covering. And this is a
constant process, for the flow of fluid to the heart, out of
which the blood is generated, is constant. It is in the
heart that blood is first formed. One can observe this 6
plainly in the growth of an embryo.[1] For before the
veins are distinguishable the heart is seen to contain
blood. Pulsation, for this reason, is more marked in
youth than in old age. For the process of evaporation
is stronger in youth. The blood vessels all pulsate, and 7
they do so simultaneously, for they are all connected
with the heart and originate in it. The heart, however,
is in constant motion. So, too, the blood vessels are in
constant motion, and simultaneously with each other, as
long as the heart moves. Palpitation, then, is a reaction in the heart due to the compression of heat by
the cooling of other parts of the body; pulsation is the
evaporation of the moist element as it becomes heated.

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[1] Cf. note 1, p. 276.

CHAPTER XXI.

RESPIRATION is due to the increase of the heated element, in which the nutritive principle is lodged. As all other bodily elements need maintenance, so does this element of vital heat, and even in a greater degree than the others, for it is the source of maintenance for the other elements. When it is increased, it necessarily expands the organ in which it
2 is found. One must conceive the structure of this organ to resemble a brazier's bellows. For neither lungs nor heart differ very much from a form such as is illustrated by a bellows. Both are double.[1] The nutritive principle must be situated in the centre of the vital power.[2] The lungs then increase and expand, and, by expanding, the part in which they are lodged must also expand. We see this
3 when we respire. For the thorax is then expanded, because the inherent principle in this part is expanded. Owing to this expansion, as one sees in the bellows, cold air must be introduced from without and, by
480 *b* its cooling effect, the excess of internal heat is lowered.

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[1] There was a double as well as single form of bellows in use in ancient Greece.

[2] Ogle adopts a conjecture of Mr. Poste—ψυκτικῆς for φυσικῆς.

But just as the organ was expanded owing to the increase 4
of heat, so now it necessarily contracts when the heat is
diminished, and by contracting, the air which was inhaled
is again discharged—air that was cold when admitted, but
warm when discharged owing to contact with the heat
inherent in the organ, especially in the case of animals
whose lungs are well-filled with blood. The air enters
through a mass of pipes, canals as it were, with which the
lungs are provided, and blood vessels extend alongside each
of these pipes, so that the entire lung appears to be filled
with blood. The admission of air is termed inspiration, 5
and its discharge, expiration. The process of respiration
is continuous, so long as life and this organic motion
continue. Life, therefore, is given in the processes of
inspiration and expiration. The movement of the gills
in fishes is produced in the same way. For by the 6
expansion of the blood's heat in its course through the
members, the gills are lifted and water passes through.
When, on the other hand, the heat retreats to the heart
through the channels and cooling is effected, the gills are
lowered and the water passes out. The expansion of the
heart's heat is constant and its re-admission when cooled
is constant. And so in animals provided with lungs, life
and death are ultimately conditioned by respiration, and
in fishes by the admission of water.

This, then, is a statement of our views of life and death 7
and of almost all the questions germane to them. It is
the province not only of the physician, but also of the
natural philosopher, up to a certain point,[1] to discuss
questions of health and disease. We must not, however,

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[1] Reading *μέχρι του* for *μέχρι τοῦ*.

forget how these two classes of men differ and how they regard a subject from different points of view, although experience shows that both professions are, to a certain extent at least, conterminous. For the better educated and more painstaking physicians are conversant with the laws of nature and deem it correct to derive their principles of practice from this source, while the best trained philosophers[1] of nature almost always conclude with a discussion of the principles of medicine.

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[1] Cf. *De sensu*, 436*a* 19 ff.

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